Engineering Library

News of the Industry Begins Page 847

AUTOMOTIVE INDUSTRIES

LAND AIR WATER

Volume 64
Number 22

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PHILADELPHIA, MAY 30, 1931

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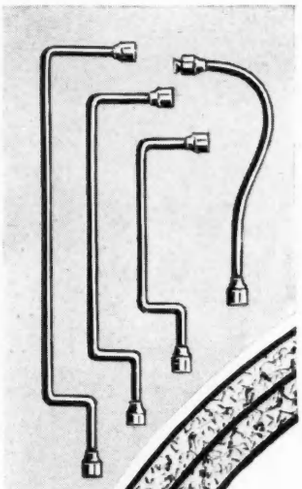

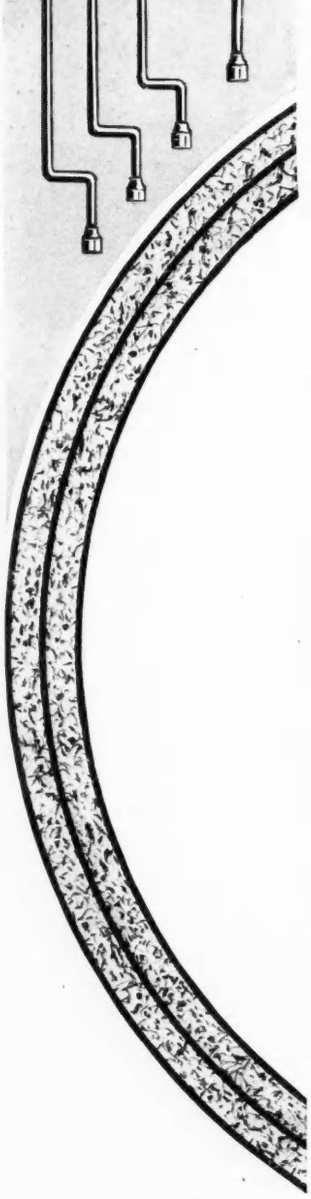

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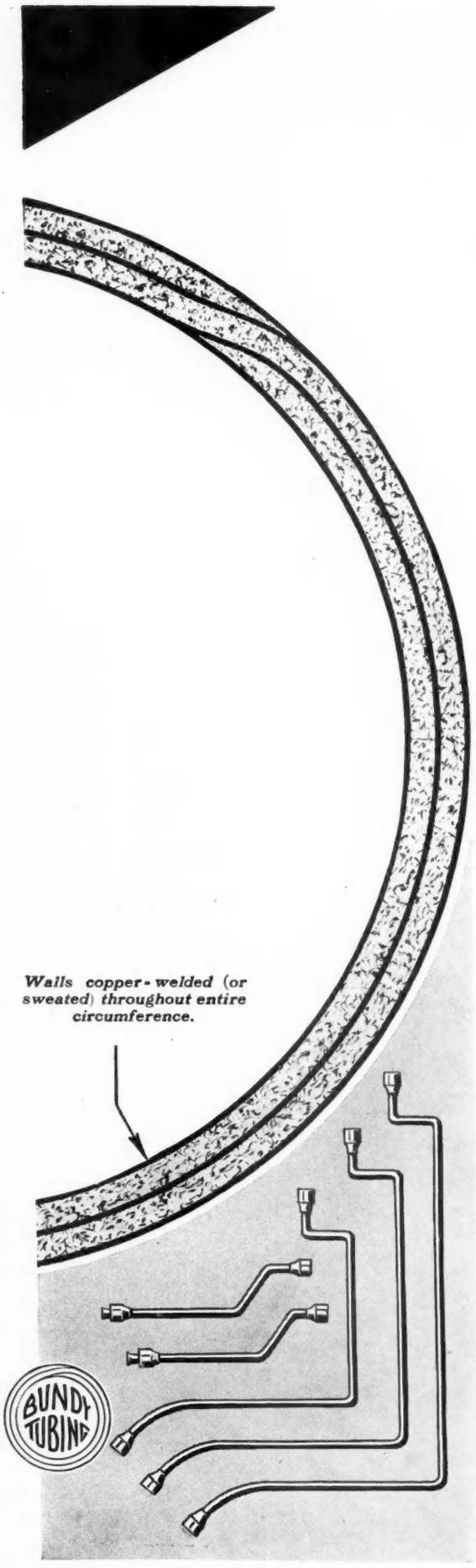

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The AUTOMOBILE

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Vol. 64 No. 22

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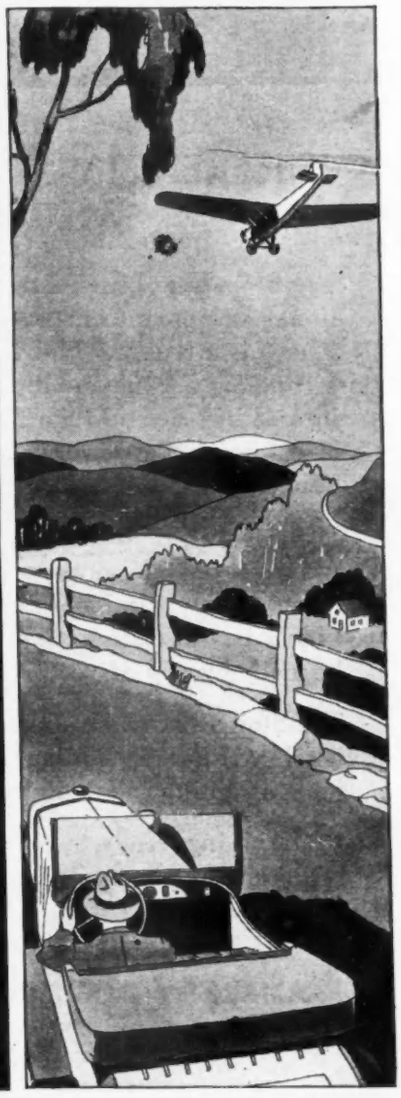
WYMAN-GORDON
GUARANTEED
FORGINGS

IN THE AIR TO-DAY AS ON THE HIGH-WAYS

FOR THE PAST 30 YEARS



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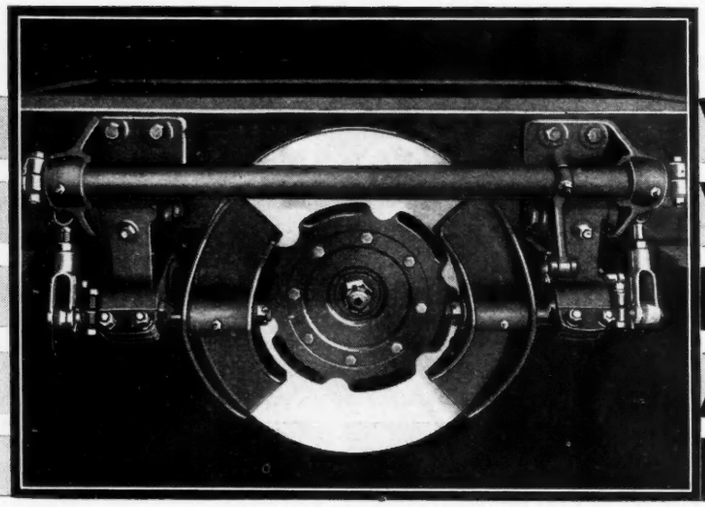

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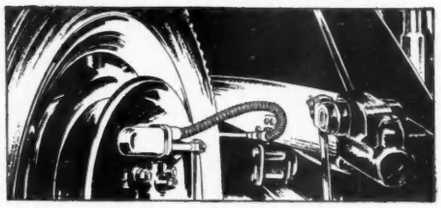

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AUTOMOTIVE INDUSTRIES

VOLUME 64 MAY 30, 1931 NUMBER 22

Heroes of Indianapolis Classic Served As Industry's Greatest Testing Crew

by Leslie Peat

WHERE are the Indianapolis Memorial Day winners of years gone by?

They, with the hundreds of drivers who pioneered mechanical developments in the broiling grind of the 500-mile Hoosier track, have performed for more than a million-and-a-half spectators in the nineteen events since the speedway was built in 1909.

They demonstrated to this country the efficacy of the small-displacement engine; they contributed to the gruelling testing of balloon tires, superchargers and other mechanical developments of the automotive industry. They served in the industry's most famous laboratory.

At the 2½-mile Indianapolis track and on speedways throughout the country they put on the greatest merchandising demonstration in history. In earlier years this was one of the principal methods of determining the public acceptance of automobiles. And the nearer the race rules come to stock car specifications, the

(Turn to page 829, please)

1911—Ray Harroun (Marmon Wasp), six cylinders, average 74.59 m.p.h. (Time, 6:42.) He has not been racing for 15 years. He has been connected in various ways with the automobile business since he quit racing and, at one time, built a car, the Harroun.

1912—Joe Dawson (National), four cylinders, average 78.7 m.p.h. (Time, 6:21:06.) He was one of the youngest to win, quit racing long ago, and for several years has been service manager of the Marmon Philadelphia Co., at Philadelphia. He is the A.A.A. racing representative for his district.

1913—Jules Goux (Peugeot), four cylinders, average 76.92 m.p.h. (Time, 6:35:05.) He married an American girl, sister of Spencer Wishart, race driver, and is still in the automobile business in France and, up to last year, still raced occasionally.

1914—Rene Thomas (Delage), four cylinders, average 82.47 m.p.h. (Time, 6:03:45.) The last heard of Thomas he was still alive in England and France, and information was that he tried to find a mount to come over for this race, but failed.

1915—Ralph De Palma (Mercedes), four cylinders, average 89.84 m.p.h. (Time, 5:33:55.51.) De Palma is the inventor of a supercharger, but still appears on the dirt tracks occasionally, and will enter a Miller-Wehr Special this year.

1916—Dario Resta (Peugeot), four cylinders, average 83.26 m.p.h. (Time, 3:34:17—Note: 300-mile race.) He continued to race after winning in Indianapolis, and was killed at the Brooklands track, England, on Sept. 2, 1924.

1919—Howard Wilcox (Peugeot), four cylinders, average 88.06 m.p.h. (Time, 5:40:42.87.) He was killed in a race at Altoona, Pa., on Sept. 4, 1923.

1920—Gaston Chevrolet (Monroe), four cylinders, average 88.50 m.p.h. (Time, 5:38:32.) He was killed in a race on the board track at Beverly Hills, Calif., on November 25, the same year.

1921—Tommy Milton (Frontenac), eight cylinders, average 89.62 m.p.h. (Time, 5:34:44.65.) He quit racing a few years ago. He is now a consulting engineer, retaining his interest in racing but does not drive.

1922—J. A. (Jimmy) Murphy (Murphy Special), eight cylinders, average 94.48 m.p.h. (Time, 5:17:30.79.) He was killed at Syracuse on the mile dirt track there on Sept. 15, 1924.

1923—Tommy Milton (H.C.S. Special), eight cylinders, average 90.95 m.p.h. (Time, 5:29:50.17.) The only two-time winner of the Indianapolis race. See 1921.

1924—L. L. Corum (Duesenberg), eight cylinders, average 98.23 m.p.h. (Time, 5:05:23.51.) He had about quit racing and is a member of the Stutz factory experimental staff, but plans to drive the Stutz Bearcat stock car entered by Milton Jones of Cleveland, Ohio, in this year's event.

1925—Peter De Paolo (Duesenberg), eight cylinders, average 101.13 m.p.h., the track record. (Time, 4:56:39.46.) He has two cars entered in the coming race, and will drive one himself.

1926—Frank Lockhart (Miller), eight cylinders, average, 95.885 m.p.h. (Time, 4:10:17.95.) After this race he achieved great fame as a driver. He built a car for the Daytona trials in 1928 and was killed there while attempting a world's record, on April 25, 1928. Holds world's record of 198 m.p.h. on the beach for a 183-cu.-in. car.

1927—George Souders (Duesenberg), eight cylinders, average 97.54 m.p.h. (Time, 5:07:33.8.) He was badly injured in a race at Detroit in July of 1928, after he had placed third in the Indianapolis race that year, and has not raced since. He lives in Lafayette, Ind.

1928—Louie Meyer (Miller), eight cylinders, average 99.82 m.p.h. (Time, 5:01:33.75.) Second to the fastest average ever made. (See 1930.) Placed second in the 1929 500-mile race. He will drive a Sampson Special, a 16-cylinder car, in the race today.

1929—Ray Keech (Simplex Special), eight cylinders, average 97.58 m.p.h. (Time, 5:07:25:42.) On June 15, six weeks after the Indianapolis race, Keech, a Philadelphian, was killed in a race on the Altoona speedway.

1930—Billy Arnold (Hartz), eight cylinders, average 100.448 m.p.h. (Time, 4:58:39.72.) Was one of the youngest winners of the classic with next to fastest average ever made. (See 1925.) Has entered the 1931 race with a front-drive, Miller-Hartz Special.

Joe Boyer, relief driver with L. L. Corum in 1924, died in September of that year, and Norman Batten, who helped Peter De Paolo drive his Duesenberg to first place in 1925, drowned when the Vestos foundered Nov. 12, 1928.

In a recent radio talk Gar Wood said, "My boat, Miss America IX, has two Packard engines of 1060 hp. each and weighing 1500 lb. apiece. Miss England II has two Rolls-Royce engines no heavier than mine, but delivering 2000 hp. each, just twice the power in Miss America IX. There are no engines in this country to compete with them" + + + +

Is High Speed Competition

by Athel F. Denham

WHEN Gar Wood a few weeks ago failed, even though by less than one mile per hour, to regain the world's speed record on water, wrested from him in February by Kaye Don in Miss England II, the last major world's record passed out of the United States. Whether or not, in possible subsequent try-outs, Gar Wood is able to shade Don's record of 103.49 m.p.h., with his present boat and engines, there appears to be but little hope that he will be able to retain it for any length of time.

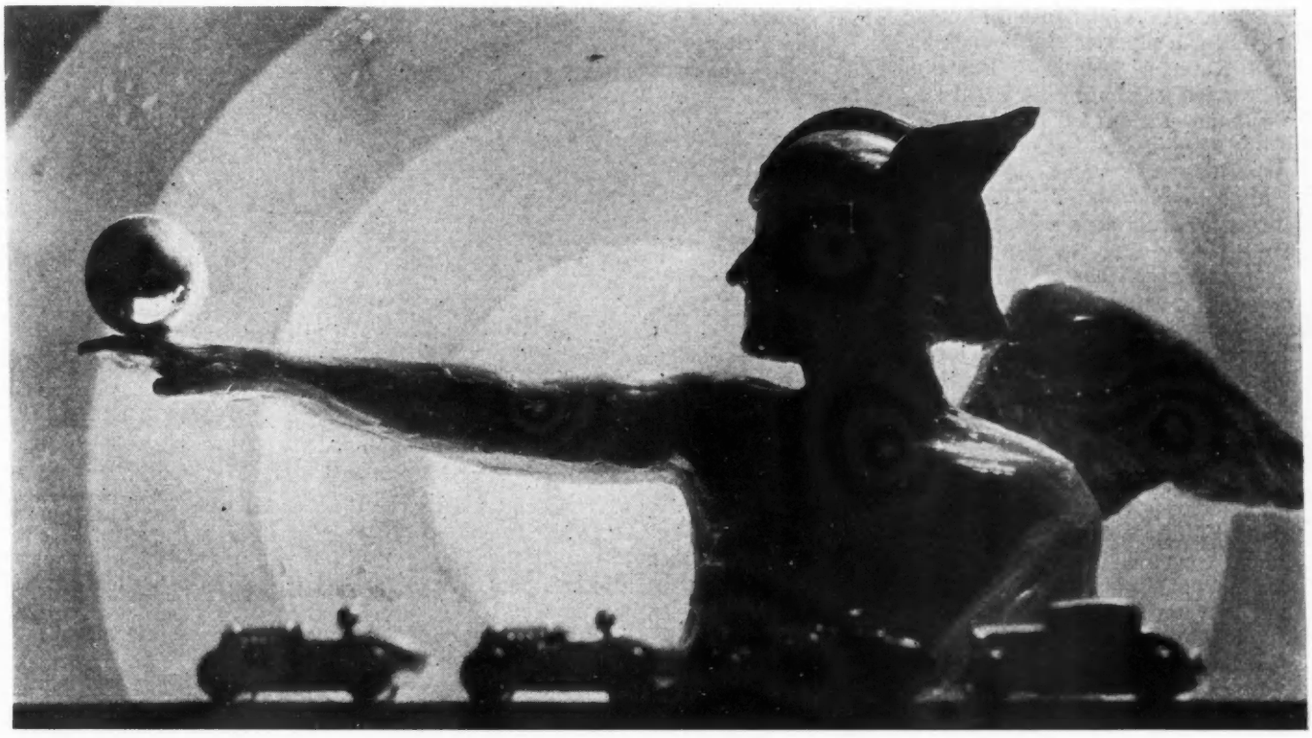
Gar Wood himself is quoted as saying, subsequent to his trials in Florida, that he may have to go abroad for engines to bring the record back to this country. Behind this statement and the events leading up to it, lies a story, a story involving airplanes, automobiles, and the United States Government.

High speed records, whether in the air, on land, or on the water, depend primarily on the ability to provide high horsepowers with a minimum of weight, and next on advances in aerodynamic design. Horsepower primarily, though. An illustration in point is Ray Keech's run at Daytona Beach in the White Triplex powered with three "souped-up" Liberty engines in a vehicle, that, aerodynamically, had but little to recommend it. With this set-up Keech captured the American, and at that time, the world's land speed record at 207.55 m.p.h. In this case brute power told the entire story. Last year Sir Malcolm Campbell took this title home with him when his single-engined Bluebird averaged 245.73 m.p.h. over the same course. While the aerodynamic design of Campbell's car had much to do with his ability to achieve this speed, the low weight per hp. of his engine, a supercharged Napier, said to develop 1450 hp. for a weight of around 1000 lb. was the major item making his record possible.

In the air the story is quite similar. Shortly after the war, and primarily as a result of it, the U. S. Government was deeply interested in the development of high output engines for high speed pursuit ships. As a means of gaging the effectiveness of this development the Pulitzer races were held annually. With the special racing ships developed as a result of these and the Schneider Cup (seaplane) races, in which America also actively participated until 1926, top speeds were gradually pushed up to 266.59 m.p.h.

Then, suddenly, all efforts on the part of the government to make further advances possible, ceased. The reason commonly given for the government's withdrawal from high speed competition was the desire to let standard pursuit ship development catch up to racing ship development. More important perhaps was a shifting of the government's concentration from the high speed ship to the reconnaissance, bomber, training and observation types. And what is even more important, the government air services evidently decided to let commercial aviation bear the brunt of developmental cost in the air.

Abroad however, subsidized development continued. In England the Napier and Rolls Royce engines were pushed to higher and higher specific outputs by research work enabling the use of compression ratios upward to 10 to one, and the development of superchargers further raising the brake mean effective pressure. In Italy more or less the same story is true, with the Fiat engine as the most striking example. France also has been developing its aircraft powerplants, particularly the Hispano Suiza type. In all of these countries the development cost has been met by government appropriations.



a Dead Issue in This Country?

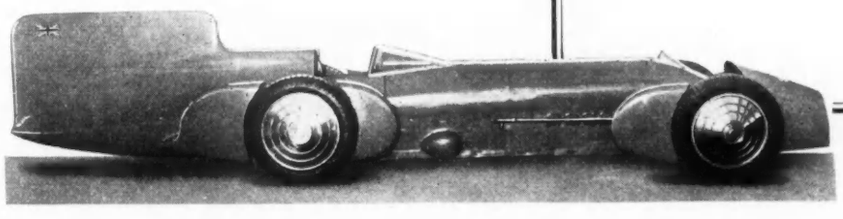
As early as 1920, France obtained the world's landplane speed record at 278 m.p.h., although this record might be of doubtful value considering the tremendously high landing speed of the record-breaking plane. Without the participation of the United States, Italy and England between them finally pushed the seaplane speed record to 357.723 m.p.h., England being the present title holder.

Three types of powerplants have been used in this country in the past decade (if we except such special cases as the White Triplex), for high speed competition, the Packard 2500 series, the 12 cylinder Curtiss, originating as the D-12 and the Wright T water-cooled 12-cylinder series. The former has been Gar Wood's standby on the water, with the Curtiss type in the lead in the air.

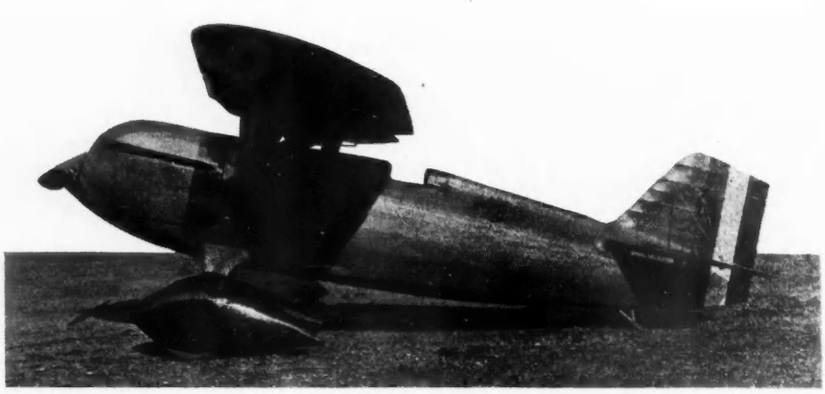
Two years ago, when the government clearly indicated that it would not

History of Automobile Speed Record

YEAR	DRIVER	CAR	SPEED M.P.H.
1898	Chasseloup-Laubat	Jeantaud	39.24
1899	Jenatzy	Jenatzy	65.79
1902	Augiers	Mors	77.13
1903	Henry Ford	Ford	91.37
1904	Baras	Darracq	104.53
1905	Bowden	Mercedes	109.75
1906	Marriott	Stanley Steamer	127.66
1910	Oldfield	Benz	131.72
1911	Burman	Benz	141.73
1919	De Palma	Packard	149.88
1920	Milton	Duesenberg	156.05
1926	Parry-Thomas	Thomas Sp.	170.62
1927	Segrave	Sunbeam	203.79
1928	Keech	White Triplex	207.55
1929	Segrave	Irving Napier	231.36
1931	Campbell	Bluebird	245.73



continue its high speed efforts, nor enter a plane in the Schneider Cup Race, a group of Eastern sportsmen, headed by Lt. Alford J. Williams, attempted to build a plane around the Packard X engine, one of which had been bought by the Navy. The Navy agreed to lend its support to the extent of loaning its engine on a "test contract" basis. The ship was built primarily for a high speed record. In its first trials the pontoons were shown to have insufficient buoyancy, and after correcting this defect the aerodynamic qualities of the ship were far enough off so that it was impossible to reach a speed anywhere near a record-making possibility. While a smaller ship, built around a smaller pilot than Alford J. Williams, might have shown an ability to surpass the then existing record, the trials made it evident again, that to put the United States well ahead of foreign competition, where it had been only a few years previously, implied the necessity of developing a considerably higher output engine with a frontal area not larger than the Packard X, and probably smaller. Offers to do this on the part of engine manufacturers did not find a receptive attitude on the part of the government.



The attempts of Lt. Williams to enter the Schneider Cup Races two years ago demonstrated that an engine was needed with a frontal area not exceeding the Packard X and with a higher output + +

Further sporting high speed attempts in the air appeared to be at an end, therefore due mainly to lack of a more advanced design of powerplant. On land, private capital enabled the continuation of high speed development, mainly by the application of aerodynamic design. But even here with Frank Lockhart's fatal

Jacques Schneider Seaplane Trophy Winners

MONACO, 1913—16th April
France — M. Prevost.
Deperdussin Seaplane, 160 hp. Gnome engine.
Distance: 277.800 kilometers (172.556 miles).
Time: 3 hr., 48 min., 22 sec.
Speed: 72.6 kilometers (45.75 miles) per hour.

MONACO, 1914—20th April
Great Britain — C. Howard Pixton.
Sopwith Seaplane, 100 hp. Monosoupape Gnome engine.
Distance: 277.800 kilometers (172.556 miles).
Time: 2 hr., 16 sec.
Speed: 139.660 kilometers (86.780 miles) per hour.

VENICE, 1920—20th and 21st September
Italy — Luigi Bologna.
Savoia 5.19. 550 hp. Ansaldo-S. Giorgio engine.
Distance: 375 kilometers (233.013 miles).
Time: 2 hr., 10 min., 35 sec.
Speed: 172.561 kilometers (107.224 miles) per hour.

VENICE, 1921—6th and 7th August
Italy — Giovanni De Briganti.
Macchi VII Flying Boat, 200 hp. Isotta Fraschini engine.
Time: 2 hr., 4 min., 29 sec.
Speed: 189.677 kilometers (117.859 miles) per hour.
Distance: 370.4 kilometers (230.155 miles).

NAPLES, 1922—10th and 12th August
Great Britain — H. C. Biard.
Supermarine Flying Boat, 450 hp. Napier "Lion" engine.
Distance: 370.77 kilometers (230.385 miles).
Time: 1 hr., 34 min., 51 3/5 sec.
Speed: 234.516 kilometers (145.7 miles) per hour.

COWES, Isle of Wight, 1923—27th and 28th September
America — Lieut. David Rittenhouse, U.S.N.
Curtiss Navy Racer C.R.3, 465 hp. Curtiss D.12 engine.
Distance: 344.472 kilometers (214.044 miles).
Time: 1 hr., 12 min., 26 4/5 sec.
Speed: 285.457 kilometers (177.38 miles) per hour.

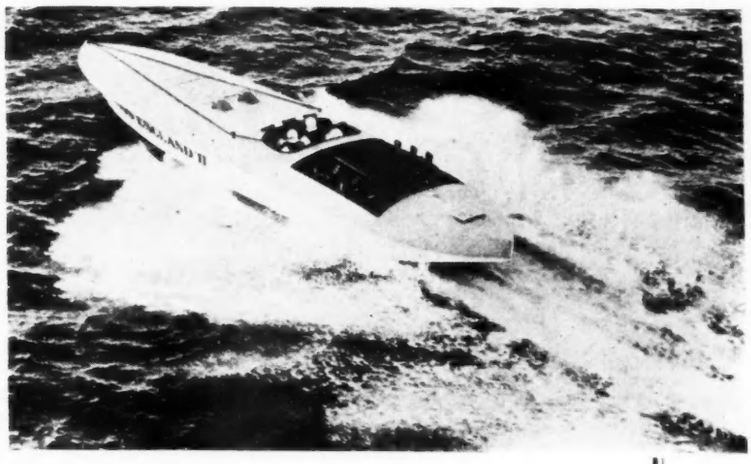
BALTIMORE, U.S.A., 1925—23rd and 26th October
America — Lieut. James Doolittle, U.S.A.
Curtiss Army Racer R.3C.2, Curtiss V. 1400 engine.
Distance: 350 kilometers (217.47 miles).
Time: 56 min., 6.36 sec.
Speed: 374.274 kilometers (232.57 miles) per hour.

HAMPTON ROADS, U.S.A., 1926—12th and 13th November
Italy — Major Mario di Bernardi.
Macchi Mono-Seaplane, 800 hp. Fiat engine.
Distance: 350 kilometers (217.47 miles).
Speed: 396.612 kilometers (246.442 miles) per hour.

THE LIDO, VENICE, 1927—24th and 26th September
Great Britain — Flight-Lieut. S. N. Webster, A.F.C.
Supermarine Napier S.5.
Distance: 350 kilometers (217.47 miles).
Time: 46 min., 15 sec.
Speed: 453.282 kilometers (281.656 miles) per hour.

SPITHEAD, 1929—6th and 7th September
Great Britain — Flying Officer H. R. D. Waghorn.
Supermarine Rolls-Royce S.6, No. 2.
Distance: 350 kilometers (217.47 miles).
Time: 39 min., 42 4/5 sec.
Speed: 528.879 kilometers (328.63 miles) per hour.

While the speed records of the planes of other countries have been mounting, no American plane has been able to better the one made by Lt. Alford J. Williams, in a Curtiss plane at Mitchell Field, on November 4, 1923. His time was 266.59 m.p.h. + + + + + + + + + + + + + + +



Kaye Don, British racer, drove the Miss England II 103.49 land miles per hour on the River Parana, Argentina, April 2, 1931, breaking Gar Wood's record of 102.256 land miles per hour made in Miss America IX only a few weeks before +

accident at Daytona Beach with a car that might almost be called a midget compared with the racing colossi of the late Major Sir Henry Segrave, and Sir Malcolm Campbell, the story seems to have come to an end.

On the water, Gar Wood continued to hold the high speed record largely as a result of his keen boat building ability. While the reliability of the functioning of his engines virtually assured for him victory in the Harmsworth trophy race, when everything else was taken into account, the British, however, began to draw closer to him in the matter of high speeds for short durations. As soon as foreign powerplant development had reached the point where, with improvements in British hull design, it exceeded Wood's boat building and handling ability, Segrave's Miss England II with Kaye Don at the wheel surpassed Wood's record, reaching the aforementioned mark of 103.49 m.p.h. In the meantime Wood, using virtually the same engines for better than three years, had been pushing up the output of his engines by the only expedient open to him: turning them over faster. This year they were turning over 2700 r.p.m., 400 revolutions beyond the limit considered safe by the Packard Co. There is no reason to suppose that with either the Rolls or Napier engines, and a further improvement in hull design, that the British record cannot be pushed upward another ten miles or so.

Anticipating this year's competition, Gar Wood had been trying to obtain from the Packard Co. some of its series 2500 engines, equipped with suitable superchargers. It is, of course, possible that the Packard 2500's can be supercharged to an extent making possible a five mile per hour increase in speed, and changed to stand the strain of the resulting overload by further internal development, but just who is to supply the necessary capital for this development is a question to which there seems to be no answer as yet.

Moreover, engine designers in this country claim that to date no spark plugs have been developed which will stand up under the heat conditions equivalent to a 10 to 1 or higher compression ratio. That these are available abroad is attested to by the successful performance of the Napier and other engines. Such a development again involves the necessity of capital, which neither the engine builder nor the spark plug manufacturer, with no commercial possibilities immediately ahead, is willing to supply.

If there is to be a return of high speed competition and the development in the branches of the automotive industry that should result therefrom, either the government or some central non-commercial research organization will have to take a hand. Abroad the knowledge gained from high output engine development has already resulted in improved performance of air service ships.

What is needed then is an engine capable of delivering 1500 hp. for a weight of not to exceed say 1200 lb., dry, before an American automobile, airplane, or motorboat can be built with the hope of setting a new speed record. That much could be learned regarding internal combustion engines, aerodynamics, fuel, etc., through such a project cannot be doubted, but neither commercial aviation, nor its engine builders can afford to invest the needed capital in a project the returns from which are as far in the future as they would necessarily have to be.

Heroes of Indianapolis Classic Served As Industry's Greatest Testing Crew

(*Continued from page* 825)

more merchandising value can be had from race results in the years to come.

The front-drive car was introduced to the general public in this country, when, in 1925, Dave Lewis and Bennett Hill raced to second place in the Miller Special of that year. Other front-drive entries since then contributed to the acceptance of the Cord—the first front-drive car produced on a commercial basis in the United States.

Each of the eighteen races have had their spectacular displays of risk. Heroes of the track have been many. Tremendous energy, brilliant driving, track strategy, and heroism of scores of men who neither placed nor finished, would fill a sizeable book of valiant achievement.

Even the acclaim of winners has frequently been dimmed by the din of applause for some spectacle of bravery or brilliant manoeuvering. The histories of many of the heroes in victory and defeat alike have been dimmed with time or have faded completely into the limbo of forgotten things.

JUST AMONG OURSELVES

And Two Times Two is—

R. N. JANEWAY told this one to a student activities section of the S.A.E. in Detroit recently to help account for the air of mystery which so often surrounds the subject of mathematics.

The story tells of the absent-minded college professor who was explaining the operation of the slide rule to his class. He said: "Now, boys, suppose we want to multiply two by two. First we set the one on the sliding scale over the two on the lower scale. Then we move the rider over to the two on the sliding scale and underneath it we read 3.995."

Discounts to Independents Has Not Helped

NEW evidence comes in every day proving that the only way for car and truck factories to sell more replacement parts is to get a greater percentage of repair business into the shops of their own dealers. Even then, they will continue to find themselves in direct competition with the independent parts maker who, through active jobber distribution, often surpasses what the car maker has to offer in the way of convenience, service and general availability of supply.

Anyhow, the car dealer as a vendor of "original" replacement parts to independent garages and repair shops has turned out to be almost a total loss. Many vehicle manufacturers and dealers seem to have learned with surprise that the mere giving of discounts to independents hasn't brought in any great amount of independent business; nor has reduction of prices accomplished that end.

Exchanging ideas recently, car dealers in one major city agreed that independent repair shops were purchasing from them only such parts as couldn't possibly be obtained elsewhere. Several car dealers had discontinued giving discounts to independents. And several service managers reported that discontinuing discounts had no adverse effect on parts volume.

Merchandising Replacement Parts

HAVING sensed this condition for some while back, certain car makers are giving thought to discontinuing all discounts now allowed to independents on replacement parts. "We sell only parts which can't be purchased elsewhere, anyhow," they argue, "so why should we give a discount? We didn't used to give one. Now we've tried it out and it doesn't work."

If it be granted that vehicle dealers never can be made to see the profit possibilities in actually merchandising parts to independents and in giving the prompt, eager service and positive sales effort that go to make up real merchandising activity, the argument in favor of discontinuing parts discounts to independents becomes very strong. And there may be good reason in the idea that the average car dealer can well spend his time more profitably than in trying to be a parts wholesaler. The chief argument in favor of retaining discounts lies, first in the gesture which it makes to provide availability of original parts for the car owner wherever and whenever he gets his car serviced; and second, in the belief that gradually the average car dealer will see some advantage to himself from taking an active interest in wider merchandising of parts.

Experience to date is all against this latter condition ever coming about. So the independent parts maker will continue to entrench himself more and more firmly in the position of replacement parts dominance which his sound, constructive merchandising efforts have won for him in the past. The final engagement in the battle for replacement parts business will not be fought on the field of price and discount.—N.G.S.

Rapid Calculation of Bearing Loads Can Be Made With Simplified Forms

Tremendous time-saving in determining pressures is made possible by using simple arithmetic processes with charts shown on following pages + + +

by Robert N. Janeway

TO achieve freedom from bearing trouble and long bearing life is once more becoming a serious problem for the automotive engine designer. In the earlier days of the automobile, burned-out rod and main bearings were a frequent occurrence. Then the development in bearing materials, design, precision manufacture, pressure lubrication, etc., enabled designers to overcome their difficulties. The troubles then lay largely in the bearings themselves.

For a number of years thereafter, bearing troubles proved to be the infrequent exception rather than the rule. It is only with the advent of the present day high pressure tendency in engine design, which has brought about operating speeds of 4000 r. p. m. as not unconventional practice, especially in eight cylinder powerplants, that bearing life has once more become a serious problem.

It is now, however, the higher operating range of bearing temperatures that has demonstrated itself to be the most frequently occurring cause. In some current designs, oil coolers have already become necessities for bearing existence.

That the control of maximum bearing temperatures is imperative is evident from three considerations:

1. The possibility of reaching the melting point of the bearing metal; but even if this is not reached

2. The strength of the bearing metal decreases rapidly as temperature increases, and moreover

3. The load carrying capacity of the oil film itself decreases with oil viscosity. The higher the temperature of the oil in the bearing, the lower the load required to break through the oil film in that bearing.

While oil coolers can of course be used to reduce dangerously high bearing temperatures, their major function should be mainly to provide an additional safeguard for engines in which the danger point is not normally reached. It is obvious that the designer should, if possible, first attempt to reduce the maximum temperature by inherent design at the bearings to attain the greatest assurance of freedom from seizure and longer life.

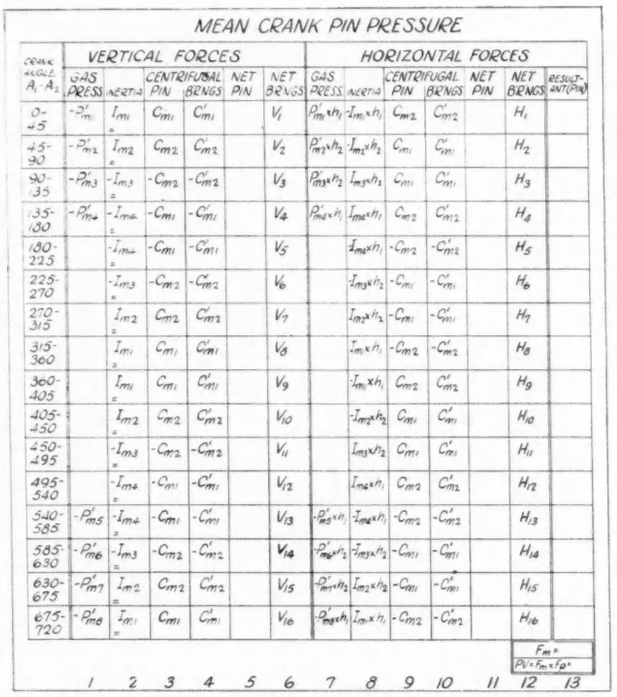
To determine the causes of high oil temperatures at the bearings some considerations regarding lubricating conditions are necessary. The question that first arises is whether we have or do not have perfect film lubrication. If a perfect and continuous oil film could be maintained, the coefficient of friction would decrease in proportion to increase in load so that total frictional resistance would be independent of load. Anyone who has ever examined a set of engine bearings which have lived through sustained high speed operation, must be convinced, from the abrasion of the bearing surfaces, that a perfect oil film has not been continuously maintained.

Furthermore there is no basis in the data available on lubrication for believing that a perfect oil film could be maintained under the pressure and temperatures to which engine bearings are subjected. Tower's experiments, the results of which may be taken as characteristic of most of the data available, show that with bath lubrication, in the range of velocities up to 500 ft./min., the coefficient of friction varied inversely with the pressure, indicating the probability of a continuous film, up to only about 350 lb./sq. in. Be-

How would you like to calculate engine bearing loads at the rate of 45 minutes per bearing?

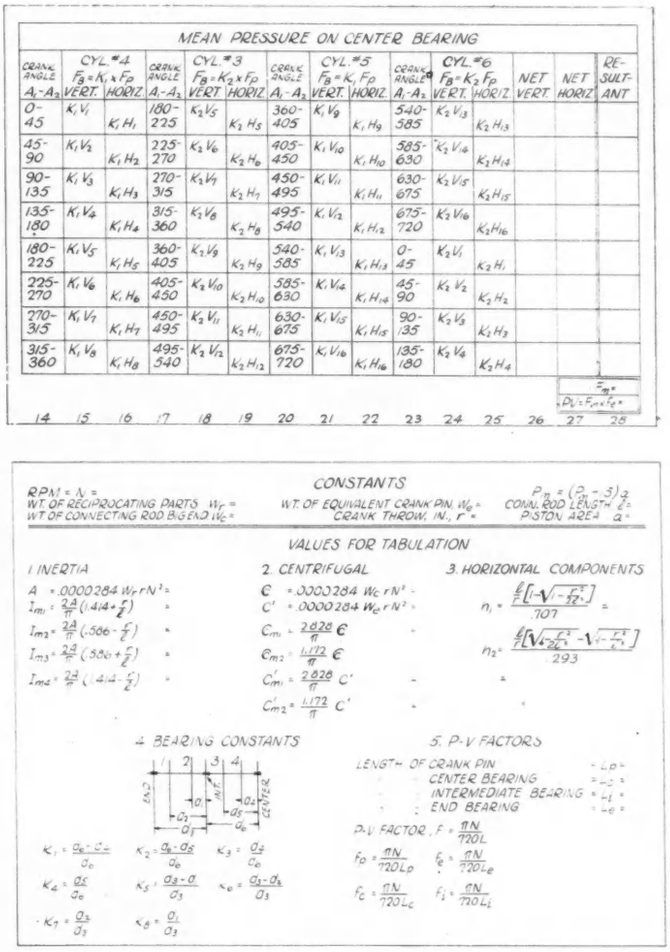
A new trial to these calculations is blazed by the method described in this article and Part Two, which will appear in Automotive Industries next week.

Higher engine speeds of today demand more careful and more rapid calculations of these pressures than ever before—this series is presented to furnish our readers with a new method to make these important calculations quickly.



MEAN CRANK PIN PRESSURE

Crank Angle A_1-A_2	Vertical Forces: Gas Press.	Inertia	Centrifugal Pin	Centrifugal Brngs.	Net Pin	Net Brngs.	Horizontal Forces: Gas Press.	Inertia	Centrifugal Pin	Centrifugal Brngs.	Net Pin	Net Brngs.	Resultant (Pin)
0-45	$-P'_{m1}$	I_{m1}	C_{m1}	C'_{m1}		V_1	$P'_{m1}\times h_2 - I_{m1}\times h_1$		C_{m2}	C'_{m2}		H_1	
45-90	$-P'_{m2}$	I_{m2}	C_{m2}	C'_{m2}		V_2	$P'_{m2}\times h_2 - I_{m2}\times h_2$		C_{m1}	C'_{m1}		H_2	
90-135	$-P'_{m3}$	$-I_{m3}$	$-C_{m2}$	$-C'_{m2}$		V_3	$P'_{m3}\times h_2 - I_{m3}\times h_2$		C_{m1}	C'_{m1}		H_3	
135-180	$-P'_{m4}$	$-I_{m4}$	$-C_{m1}$	$-C'_{m1}$		V_4	$P'_{m4}\times h_1 - I_{m4}\times h_1$		C_{m2}	C'_{m2}		H_4	
180-225		$-I_{m4}$	$-C_{m1}$	$-C'_{m1}$		V_5		$I_{m4}\times h_1$	$-C_{m2}$	$-C'_{m2}$		H_5	
225-270		$-I_{m3}$	$-C_{m2}$	$-C'_{m2}$		V_6		$I_{m3}\times h_2$	$-C_{m1}$	$-C'_{m1}$		H_6	
270-315		I_{m2}	C_{m2}	C'_{m2}		V_7		$I_{m2}\times h_2$	$-C_{m1}$	$-C'_{m1}$		H_7	
315-360		I_{m1}	C_{m1}	C'_{m1}		V_8		$I_{m1}\times h_1$	$-C_{m2}$	$-C'_{m2}$		H_8	
360-405		I_{m1}	C_{m1}	C'_{m1}		V_9		$-I_{m1}\times h_1$	C_{m2}	C'_{m2}		H_9	
405-450		I_{m2}	C_{m2}	C'_{m2}		V_{10}		$-I_{m2}\times h_2$	C_{m1}	C'_{m1}		H_{10}	
450-495		$-I_{m3}$	$-C_{m2}$	$-C'_{m2}$		V_{11}		$I_{m3}\times h_2$	C_{m1}	C'_{m1}		H_{11}	
495-540		$-I_{m4}$	$-C_{m1}$	$-C'_{m1}$		V_{12}		$I_{m4}\times h_1$	C_{m2}	C'_{m2}		H_{12}	
540-585	$-P'_{m5}$	$-I_{m4}$	$-C_{m1}$	$-C'_{m1}$		V_{13}	$-P'_{m5}\times h_1$	$-I_{m4}\times h_1$	$-C_{m2}$	$-C'_{m2}$		H_{13}	
585-630	$-P'_{m6}$	$-I_{m3}$	$-C_{m2}$	$-C'_{m2}$		V_{14}	$-P'_{m6}\times h_2$	$-I_{m3}\times h_2$	$-C_{m1}$	$-C'_{m1}$		H_{14}	
630-675	$-P'_{m7}$	I_{m2}	C_{m2}	C'_{m2}		V_{15}	$-P'_{m7}\times h_2$	$I_{m2}\times h_2$	$-C_{m1}$	$-C'_{m1}$		H_{15}	
675-720	$-P'_{m8}$	I_{m1}	C_{m1}	C'_{m1}		V_{16}	$-P'_{m8}\times h_1$	$I_{m1}\times h_1$	$-C_{m2}$	$-C'_{m2}$		H_{16}	
												$F_m =$	$PV = F_m \times f_p =$
	1	2	3	4	5	6	7	8	9	10	11	12	13



MEAN PRESSURE ON CENTER BEARING

Crank Angle A_1-A_2	Cyl. #4 $F_B = K_1 \times F_D$ Vert.	Horiz.	Crank Angle A_1-A_2	Cyl. #3 $F_B = K_2 \times F_D$ Vert.	Horiz.	Crank Angle A_1-A_2	Cyl. #5 $F_B = K_1 F_D$ Vert.	Horiz.	Crank Angle A_1-A_2	Cyl. #6 $F_B = K_2 F_D$ Vert.	Horiz.	Net Vert.	Net Horiz.	Resultant
0-45	K_1V_1	K_1H_1	180-225	K_2V_5	K_2H_5	360-405	K_1V_9	K_1H_9	540-585	K_2V_{13}	K_2H_{13}			
45-90	K_1V_2	K_1H_2	225-270	K_2V_6	K_2H_6	405-450	K_1V_{10}	K_1H_{10}	585-630	K_2V_{14}	K_2H_{14}			
90-135	K_1V_3	K_1H_3	270-315	K_2V_7	K_2H_7	450-495	K_1V_{11}	K_1H_{11}	630-675	K_2V_{15}	K_2H_{15}			
135-180	K_1V_4	K_1H_4	315-360	K_2V_8	K_2H_8	495-540	K_1V_{12}	K_1H_{12}	675-720	K_2V_{16}	K_2H_{16}			
180-225	K_1V_5	K_1H_5	360-405	K_2V_9	K_2H_9	540-585	K_1V_{13}	K_1H_{13}	0-45	K_2V_1	K_2H_1			
225-270	K_1V_6	K_1H_6	405-450	K_2V_{10}	K_2H_{10}	585-630	K_1V_{14}	K_1H_{14}	45-90	K_2V_2	K_2H_2			
270-315	K_1V_7	K_1H_7	450-495	K_2V_{11}	K_2H_{11}	630-675	K_1V_{15}	K_1H_{15}	90-135	K_2V_3	K_2H_3			
315-360	K_1V_8	K_1H_8	495-540	K_2V_{12}	K_2H_{12}	675-720	K_1V_{16}	K_1H_{16}	135-180	K_2V_4	K_2H_4			
												$\Sigma m =$		
												$PV = F_m \times f_p =$		
	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28

CONSTANTS

RPM = N =
WT. OF RECIPROCATING PARTS W_r =
WT. OF CONNECTING ROD BIG END W_c =
WT. OF EQUIVALENT CRANK PIN, W_e =
CRANK THROW, IN., r =
$P_n = (P_n - S)\frac{a}{g}$
CONN. ROD LENGTH = l =
PISTON AREA = a =

VALUES FOR TABULATION

1. INERTIA

$A = .0000284\, W_r r N^2 =$
$I_{m1} = \frac{2A}{n}(1.414 + \frac{r}{l}) =$
$I_{m2} = \frac{2A}{n}(.586 - \frac{r}{l}) =$
$I_{m3} = \frac{2A}{n}(.586 + \frac{r}{l}) =$
$I_{m4} = \frac{2A}{n}(1.414 - \frac{r}{l}) =$

2. CENTRIFUGAL

$C = .0000284\, W_c r N^2 =$
$C' = .0000284\, W_e r N^2 =$
$C_{m1} = \frac{2.828}{n} C =$
$C_{m2} = \frac{1.172}{n} C =$
$C'_{m1} = \frac{2.828}{n} C' =$
$C'_{m2} = \frac{1.172}{n} C' =$

3. HORIZONTAL COMPONENTS

$n_1 = \frac{\frac{a}{g}\left[-\sqrt{1-\frac{r^2}{l^2}}\right]}{.707} =$
$n_2 = \frac{\frac{a}{g}\left[\sqrt{1+\frac{r^2}{2l^2}} - \sqrt{1-\frac{r^2}{l^2}}\right]}{.293} =$

4. BEARING CONSTANTS

$K_1 = \frac{a_6 - a_7}{a_6}$ $K_2 = \frac{a_6 - a_5}{a_6}$ $K_3 = \frac{a_4}{a_6}$
$K_4 = \frac{a_5}{a_6}$ $K_5 = \frac{a_3 - a_7}{a_3}$ $K_6 = \frac{a_3 - a_5}{a_3}$
$K_7 = \frac{a_3}{a_3}$ $K_8 = \frac{a_1}{a_3}$

5. P-V FACTORS

LENGTH OF CRANK PIN = L_p =
" CENTER BEARING = L_c =
" INTERMEDIATE BEARING = L_i =
" END BEARING = L_e =

P-V FACTOR, $F = \frac{\pi N}{720L}$
$F_p = \frac{\pi N}{720 L_p}$ $F_e = \frac{\pi N}{720 L_e}$
$F_c = \frac{\pi N}{720 L_c}$ $F_i = \frac{\pi N}{720 L_i}$

Fig. 1—On this and the facing page is shown the standard form for determining bearing pressures in an eight-cylinder engine with a five-bearing crankshaft and firing 1-6-2-5-8-3-7-4 + + +

yond this point the coefficient remained practically constant over a considerable range of pressure, but increasing rapidly as seizure was approached.

The indication here again is obviously that a perfect oil film could not be maintained beyond 350 lb./sq. in. under the conditions of the experiment. As compared with this figure, automotive engine bearings are commonly subjected to a mean pressure of 1500 lb./sq. in., with a maximum pressure perhaps twice as great. It is therefore reasonable to assume that before the danger point of seizure is approached with its increasing coefficient of friction, there will be a considerable range of pressures in the high duty range, at which the coefficient of friction remains virtually constant.

This at least gives us a starting point in analyzing the causes of bearing failure, since it permits the establishment of an equation concerning the work done in the bearing:

(Work equals pressure x velocity x coefficient of friction.) This work, of course, must be dissipated as heat, and while some of the heat may be carried away by conduction from the bearing surfaces, by far the largest amount is transferred from the bearing to the oil circulating through it. It can further be shown (Appendix-Equation I in *Automotive Industries*, June 6) that the temperature difference between the bearing and the oil is directly proportional to the product of unit pressure on the bearing and journal velocity (PV), for given coefficients of friction and heat transfer.

The safe value of PV obviously then decreases as the oil temperature rises. On the other hand an increase in PV creates a vicious circle since it not only increases the temperature differential between the bearing and the oil, but also raises the temperature of the oil due to greater heat dissipation.

It is evident from these considerations that the product of velocity and pressure (PV) is the factor which largely determines bearing life.

While the diameter of the bearing has an important function in stiffening the shaft reflected in bearing alignment, the PV factor is dependent mainly on bearing length since an increase in diameter raises the velocity (V) in proportion to the reduction in unit pressure (P). Arbitrary limitation of overall engine lengths imposes, therefore, on the designer further difficulties in maintaining his (PV) factors within reasonable limits, by limiting the possible bearing lengths.

Unfortunately there is no clean-cut data in existence which definitely ties up the quantitative relationships between PV's and bearing and oil temperatures. The designer under the conditions met in the automotive engine must use as criteria empirical values which are bound to be questionable.

This lack of scientific data on so important a subject suggests that an investigation into this relationship with different lubricating systems should be fruitful of much needed information. All that can be said with any assurance today as to permissible PV's is that 20,000 is conservative, 30,000 is possible, 40,000 is dangerous, and anything beyond that—reckless.

High-speed engine design which does not predetermine bearing pressures is therefore, to say the least, insecure. The primary reason for the prevalent failure to predetermine bearing pressures in design lies in the difficulty of obtaining these pressures by the accepted methods of procedure. The only sufficiently accurate methods consist of the determination either graphically, or by calculation of the instantaneous resultant of

MEAN PRESSURE ON INTERMEDIATE BEARINGS

CRANK ANGLE A_1-A_2	CYL. #4 $F_B = K_3 F_P$ VERT.		CRANK ANGLE A_1-A_2	CYL. #3 $F_B = K_4 F_P$ VERT.		CRANK ANGLE A_1-A_2	CYL. #2 $F_B = K_5 F_P$ VERT.		CRANK ANGLE A_1-A_2	CYL. #1 $F_B = K_6 F_P$ VERT.		NET VERT.	NET HORIZ.	RESULTANT
		HORIZ.			HORIZ.			HORIZ.			HORIZ.			
0-45	$K_3 V_1$	$K_3 H_1$	180-225	$K_4 V_5$	$K_4 H_5$	450-495	$K_5 V_{11}$	$K_5 H_{11}$	630-675	$K_6 V_{15}$	$K_6 H_{15}$			
45-90	$K_3 V_2$	$K_3 H_2$	225-270	$K_4 V_6$	$K_4 H_6$	495-540	$K_5 V_{12}$	$K_5 H_{12}$	675-720	$K_6 V_{16}$	$K_6 H_{16}$			
90-135	$K_3 V_3$	$K_3 H_3$	270-315	$K_4 V_7$	$K_4 H_7$	540-585	$K_5 V_{13}$	$K_5 H_{13}$	0-45	$K_6 V_1$	$K_6 H_1$			
135-180	$K_3 V_4$	$K_3 H_4$	315-360	$K_4 V_8$	$K_4 H_8$	585-630	$K_5 V_{14}$	$K_5 H_{14}$	45-90	$K_6 V_2$	$K_6 H_2$			
180-225	$K_3 V_5$	$K_3 H_5$	360-405	$K_4 V_9$	$K_4 H_9$	630-675	$K_5 V_{15}$	$K_5 H_{15}$	90-135	$K_6 V_3$	$K_6 H_3$			
225-270	$K_3 V_6$	$K_3 H_6$	405-450	$K_4 V_{10}$	$K_4 H_{10}$	675-720	$K_5 V_{16}$	$K_5 H_{16}$	135-180	$K_6 V_4$	$K_6 H_4$			
270-315	$K_3 V_7$	$K_3 H_7$	450-495	$K_4 V_{11}$	$K_4 H_{11}$	0-45	$K_5 V_1$	$K_5 H_1$	180-225	$K_6 V_5$	$K_6 H_5$			
315-360	$K_3 V_8$	$K_3 H_8$	495-540	$K_4 V_{12}$	$K_4 H_{12}$	45-90	$K_5 V_2$	$K_5 H_2$	225-270	$K_6 V_6$	$K_6 H_6$			
360-405	$K_3 V_9$	$K_3 H_9$	540-585	$K_4 V_{13}$	$K_4 H_{13}$	90-135	$K_5 V_3$	$K_5 H_3$	270-315	$K_6 V_7$	$K_6 H_7$			
405-450	$K_3 V_{10}$	$K_3 H_{10}$	585-630	$K_4 V_{14}$	$K_4 H_{14}$	135-180	$K_5 V_4$	$K_5 H_4$	315-360	$K_6 V_8$	$K_6 H_8$			
450-495	$K_3 V_{11}$	$K_3 H_{11}$	630-675	$K_4 V_{15}$	$K_4 H_{15}$	180-225	$K_5 V_5$	$K_5 H_5$	360-405	$K_6 V_9$	$K_6 H_9$			
495-540	$K_3 V_{12}$	$K_3 H_{12}$	675-720	$K_4 V_{16}$	$K_4 H_{16}$	225-270	$K_5 V_6$	$K_5 H_6$	405-450	$K_6 V_{10}$	$K_6 H_{10}$			
540-585	$K_3 V_3$	$K_3 H_{13}$	0-45	$K_4 V_1$	$K_4 H_{17}$	270-315	$K_5 V_7$	$K_5 H_7$	450-495	$K_6 V_{11}$	$K_6 H_{11}$			
585-630	$K_3 V_{14}$	$K_3 H_{14}$	45-90	$K_4 V_2$	$K_4 H_2$	315-360	$K_5 V_8$	$K_5 H_8$	495-540	$K_6 V_{12}$	$K_6 H_{12}$			
630-675	$K_3 V_{15}$	$K_3 H_{15}$	90-135	$K_4 V_3$	$K_4 H_3$	360-405	$K_5 V_9$	$K_5 H_9$	540-585	$K_6 V_{13}$	$K_6 H_{13}$			
675-720	$K_3 V_{16}$	$K_3 H_{16}$	135-180	$K_4 V_4$	$K_4 H_4$	405-450	$K_5 V_{10}$	$K_5 H_{10}$	585-630	$K_6 V_{14}$	$K_6 H_{14}$			
													$F_m =$	
													$PV = F_m \times F_i$	
29	30	31	32	33	34	35	36	37	38	39	40	41	42	43

MEAN PRESSURE ON END BEARINGS

CRANK ANGLE A_1-A_2	CYL. #1 $F_B = K_7 F_P$ VERT.		CRANK ANGLE A_1-A_2	CYL. #2 $F_B = K_8 F_P$ VERT.		NET VERT.	NET HORIZ.	RESULTANT
		HORIZ.			HORIZ.			
0-45	$K_7 V_1$	$K_7 H_1$	180-225	$K_8 V_5$	$K_8 H_5$			
45-90	$K_7 V_2$	$K_7 H_2$	225-270	$K_8 V_6$	$K_8 H_6$			
90-135	$K_7 V_3$	$K_7 H_3$	270-315	$K_8 V_7$	$K_8 H_7$			
135-180	$K_7 V_4$	$K_7 H_4$	315-360	$K_8 V_8$	$K_8 H_8$			
180-225	$K_7 V_5$	$K_7 H_5$	360-405	$K_8 V_9$	$K_8 H_9$			
225-270	$K_7 V_6$	$K_7 H_6$	405-450	$K_8 V_{10}$	$K_8 H_{10}$			
270-315	$K_7 V_7$	$K_7 H_7$	450-495	$K_8 V_{11}$	$K_8 H_{11}$			
315-360	$K_7 V_8$	$K_7 H_8$	495-540	$K_8 V_{12}$	$K_8 H_{12}$			
360-405	$K_7 V_9$	$K_7 H_9$	540-585	$K_8 V_{13}$	$K_8 H_{13}$			
405-450	$K_7 V_{10}$	$K_7 H_{10}$	585-630	$K_8 V_{14}$	$K_8 H_{14}$			
450-495	$K_7 V_{11}$	$K_7 H_{11}$	630-675	$K_8 V_{15}$	$K_8 H_{15}$			
495-540	$K_7 V_{12}$	$K_7 H_{12}$	675-720	$K_8 V_{16}$	$K_8 H_{16}$			
540-585	$K_7 V_{13}$	$K_7 H_{13}$	0-45	$K_8 V_1$	$K_8 H_1$			
585-630	$K_7 V_{14}$	$K_7 H_{14}$	45-90	$K_8 V_2$	$K_8 H_2$			
630-675	$K_7 V_{15}$	$K_7 H_{15}$	90-135	$K_8 V_3$	$K_8 H_3$			
675-720	$K_7 V_{16}$	$K_7 H_{16}$	135-180	$K_8 V_4$	$K_8 H_4$			
							$F_m =$	
							$PV = F_m \times F_e$	
44	45	46	47	48	49	50	51	52

all forces acting on each bearing at equal intervals during the cycle, consisting of those due to inertia, centrifugal action and gas pressure. For accuracy, this resultant must be obtained for intervals of not more than 10 or 15 deg. of crank angle, making it a laborious process that can be carried out in a reasonable length of time only by a man of considerable experience in such work.

In addition the important item of gas pressures is a matter of considerable conjecture unless a specialist having the requisite data is available. The leisure for this sort of calculation, moreover, is rarely possible considering the rush which ordinarily accompanies the demand for a new engine design or important changes in design.

It is the object of the writer to present in detail a simplified method for the determination of bearing loads, organized in a standard form for quick routine use in design. It makes the information desired available in so many hours instead of days, with accuracy—as checks against the above mentioned methods have shown—and without the necessity for special personnel. The use of the method involves no mathematics beyond simple arithmetic operations.

Mathematical Basis of Method

The first requisite for simplifying the calculation is the reduction in the number of points at which the resultant force must be obtained during the cycle. The usual method of determining instantaneous resultants depends inherently for accuracy on a large number of points taken at small intervals. Since in that method the mean force is obtained by integration of a number of instantaneous forces, it is assumed that each instantaneous force represents the mean force over an entire interval. The error involved in this assumption increases rapidly as the intervals are extended in duration.

The proposed method, instead of considering instantaneous force, resolve all forces into vertical and horizontal components and uses the true mean values of each component over any given interval to obtain the mean resultant force for that interval. In this procedure each force component is separately integrated over the interval of crank angle to obtain the exact mean value. All mean vertical components are then added with respect to sign to determine the net mean vertical force; the same for the net mean horizontal force. The resultant of the two then represents the mean resultant for the interval. All resultants for the cycle are then averaged arithmetically to obtain the mean bearing load.

Because this method is based upon true mean values of the various force components, the accuracy of the calculation is much more nearly independent of the length of intervals. The maximum interval which can be used in any case, however, is limited by three factors, namely,

1. the cyclic change in direction of
   a. the inertia, and
   b. the centrifugal forces, and
2. the number of cylinders.

For example, the vertical component of centrifugal force changes in direction at 90 and 270 deg. of crank angle. If intervals of 60 deg. were used, then during the particular intervals 60-120 deg., and 240-300 deg., there would be a change in direction. To properly consider the effect of the vertical component of centrifugal force, the interval must be a divisor of 90

deg. Thus, 10, 15, 30 and 45 are suitable.

The primary inertia force also changes direction at 90 and 270 deg. so no special consideration is involved here. The secondary inertia force, however, changes direction at 45, 135, 225 and 315 deg. This would at first appear to limit the possible interval to 15 and 45 deg. However, 30 deg. can be used by neglecting the secondary inertia force during the intervals in which directional changes occur. This involves a negligible error, since the mean secondary inertia force during these intervals is zero, and the maximum magnitude in either direction is relatively small.

The second factor, namely, number of cylinder, is a limitation in phasing the forces at the various crankpins, to get their combined effect on the main bearings. For this purpose the interval used must be a divisor of the angular relation of crank-throws. For six and 12-cylinder engines 30-deg. intervals are therefore suitable, while 45-deg. intervals are satisfactory for four, eights and sixteens. For these intervals the various crank-throws will reach the same recurring positions throughout the complete cycle.

As previously mentioned, the bearing load for each interval is obtained from the net vertical force and net mean horizontal force for that interval, representing the addition of all the individual vertical or horizontal forces. In the case of the crankpin, the vertical forces acting are:

1. Gas pressure.
2. Inertia of reciprocating parts.
3. Vertical component of centrifugal force due to rotation of the connecting rod big end.

The horizontal forces are:

1. The horizontal component of the same centrifugal force.
2. Horizontal component of the combined pressure and inertia force due to angularity of the connecting rod.

For the determination of the resultants it is necessary only to tabulate side by side the mean values of the various component for each interval, perform the addition according to sign (direction) and derive the resultants for each interval by extracting the square root of the sum of the squares of net mean horizontal and net mean vertical forces.

The chart (Fig. 1) has been worked out as a standardized form on which to carry out this work of tabulation for an eight-cylinder engine with five-bearing crankshaft. All necessary formulae are given thereon, derivations of these formulae being included in the appendix of this discussion. The determination of the

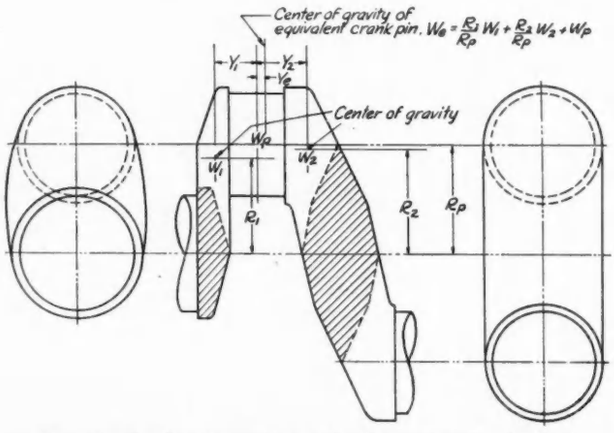


Fig. 2—Reduction of crank throw to equivalent crank pin

ABSOLUTE MEAN PRESSURES IN PER CENT. OF THEORETICAL MAX. PRESS.

COMP. RATIO			5.0:1	5.25:1	5.50:1	6.0:1
$P_{MAX.}/IMEP$			4.62	4.80	4.99	5.36
	A_1-A_2	Symbol	45° INTERVALS			
COMPRESSION EXPANSION	0-45	P_{m1}	.595 x $P_{max.}$	.592 x $P_{max.}$	.587 x $P_{max.}$	.571 x $P_{max.}$
	45-90	P_{m2}	.297	.281	.269	.250
	90-135	P_{m3}	.149	.139	.130	.117
	135-180	P_{m4}	.101	.094	.088	.079
COMPRESSION EXPANSION	540-585	P_{m5}	.029	.027	.025	.020
	585-630	P_{m6}	.036	.033	.032	.029
	630-675	P_{m7}	.069	.066	.063	.058
	675-720	P_{m8}	.176	.175	.172	.166
			30° INTERVALS			
EXPANSION	0-30	P_{m1}	.610	.611	.611	.603
	30-60	P_{m2}	.480	.463	.450	.422
	60-90	P_{m3}	.250	.236	.223	.207
	90-120	P_{m4}	.159	.150	.140	.127
	120-150	P_{m5}	.119	.110	.103	.092
	150-180	P_{m6}	.093	.087	.082	.074
COMPRESSION	540-570	P_{m7}	.027	.025	.023	.019
	570-600	P_{m8}	.031	.029	.027	.023
	600-630	P_{m9}	.039	.036	.034	.031
	630-660	P_{m10}	.060	.057	.054	.049
	660-690	P_{m11}	.106	.104	.101	.094
	690-720	P_{m12}	.203	.202	.199	.193

Fig. 3—"Pmax" in this table is the theoretical absolute maximum gas pressure in the engine cylinder

design constants of course must be first carried out. The following are needed:

W_p — weight of reciprocating parts

W_c — weight of connecting rod big end

W_e — weight of corrected equivalent crankpin

r — crank-throw in inches

l — connecting rod length

a — piston area

N — r.p.m.

P_i — ind. m.e.p. at N.

Fig. 2 illustrates the method of obtaining the equivalent crankpin, the shaded portions of the throw being those parts symmetrically disposed about the crankshaft axis, and therefore neglected in the computation. This, of course, must be corrected if the center of mass of the equivalent crankpin does not coincide with the center of the actual pin. In a five-bearing eight or three-bearing four each pair of throws between bearings is in the same plane, 180 deg. apart, and thus forms a centrifugal couple which is opposed by an equal and opposite couple produced by the bearing reactions. For this reason it is readily possible to reduce the centrifugal forces of the throws to equivalent values applied to the crankpin centers. This is done by multiplying the uncorrected equivalent crankpin weight by the ratio of the actual couple arm to the center distance between pins. (See appendix *"g," Automotive Industries*, June 6.)

Taking the columns of the table in order, No. 1 (gas pressures) represents probably one of the most troublesome items in the calculation of bearing loads primarily because there is no hard and fast formula available; in fact, there is plenty of disagreement to be found among authorities as to fundamental data upon which to base an indicator card. The best available data has therefore been compiled and a standardized pressure-volume indicator card developed from which

values of mean relative gas pressure during the cycle have been taken and arranged in tabular form for various compression ratios (see Fig. 3, also appendix in June 6 issue for derivation). "Pmax" in this table is the theoretical absolute maximum pressure for the design in question, obtained from the known or estimated l.m.e.p., as indicated in the tabulation.

By substituting the values of the constants the values for columns 2, 3 and 4 of Fig. 1 are readily arrived at from the corresponding equations given in the center of the chart under the headings "Inertia" and "Centrifugal," N being the speed in revolutions per minute at which bearing loads are being computed (maximum operating speed).

The total net vertical force on the pin for each interval is then arrived at by adding columns 1, 2 and 3, and the sum inserted in column 5 (adding according to sign), while the further addition of the values in column 4 to those in 5 give the net of all vertical forces to be distributed over the main bearings for each throw. These are listed in column 6.

To obtain the horizontal components of the gas pressures (column 7) the values in column 1 are multiplied by the factors obtained by subsituting the values for connecting rod length and crank-throw in inches in the equations given in the center of the chart, under "Horizontal components." Horizontal inertia components (column 8) are obtained in the same manner from column 2. Centrifugal horizontal components (9 and 10) both at the pin and effective on the main bearings are identical in value with the corresponding vertical components, differing in phase only, so that they can be directly transferred as indicated from columns 3 and 4.

The sum of horizontal forces at the pin (column 11) are then obtained by adding columns 7, 8 and 9, according to sign. Adding the values in column 10 to this gives the total net horizontal forces to be distributed over the bearings (column 12). The square root of the sums of the squares of the values in columns 5 and 11 gives the net resultant for each interval on the pin (13). These are then added and averaged arithmetically to give the mean resultant (F_m), in lb., which when multiplied by the bearing factor (f_p) gives the PV value for the pin. The value of the bearing factor is given also on the chart, under "PV factors," the derivation of the formula being self-evident.

For an uncounterweighted crankshaft it only remains to distribute the net vertical and horizontal columns 6 and 12 for the various intervals over the forces of columns 6 and 12 for the various intervals over the main bearings. For this purpose it is assumed that only the cylinders between the bearing under consideration and the next adjacent bearing or bearings will have to be considered as contributing to the net resultant load on that bearing. Thus for the center bearing, cylinders 3, 4, 5 and 6 are taken into consideration, and it is assumed that the forces from each of these cylinders and crankpins is distributed to the two nearest bearings according to their relative distances from the center of the pin. These ratios, or "bearing factors," are also listed on the chart and dimensions needed indicated in a sketch.

Since the values of net vertical (column 6) and the net horizontal (column 12) forces for each interval are the same for every cylinder, except for phase relation, it is necessary merely to assemble these in their correct phase relation for each interval at the main bearing. For the center main only half the complete cycle, or 360 deg., have to be considered, since the second 360 deg. would be merely a repetition of the first with the values of cylinders 3 and 4 transposed with those of 5 and 6. The chart shows the correct phasing for an engine with a firing order of 1, 6, 2, 5, 8, 3, 7, 4.

Only one intermediate bearing and one end bearing is called for in the computation given. Unless both end bearings are calculated, the shorter bearing (with its higher PV factor) should be taken.

In each case the vertical components are added according to sign to give the net vertical force for the interval at the bearing; the same for the horizontal. The square root of the sums of the net vertical and horizontal forces then give the net resultant, which when averaged arithmetically gives the net *mean* resultant. Once more multiplying each net mean resultant by the PV factor for that bearing, gives the PV value.

In the case of a counterweighted crankshaft with counterweights out of phase with the throws, the centrifugal forces set up by the

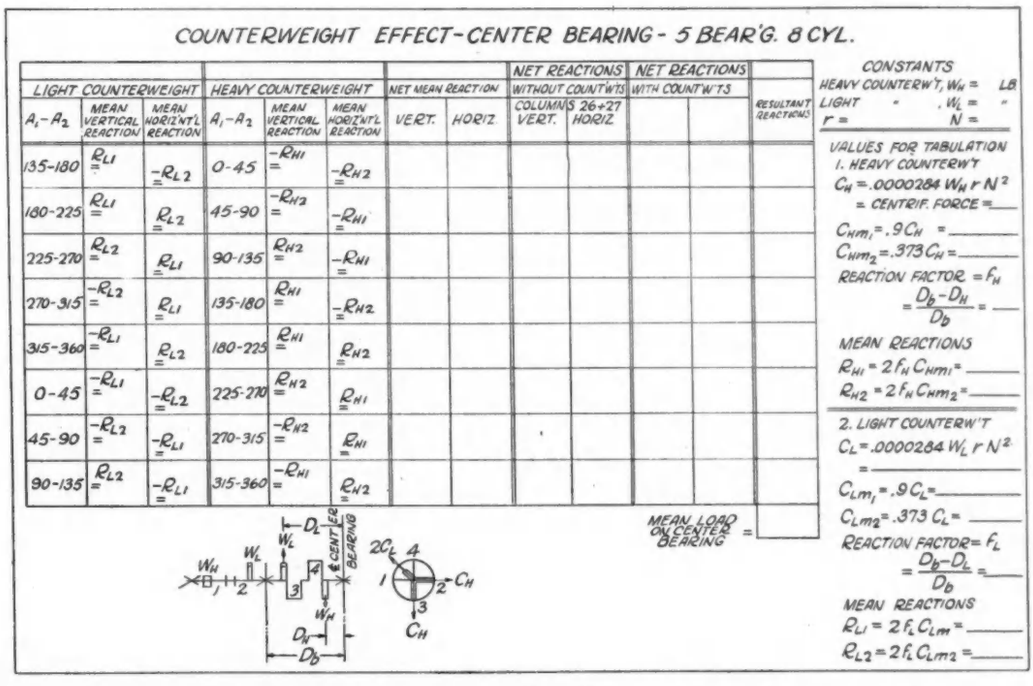


Fig. 4—Chart for determining the counterweight effect on center bearing in five-bearing eight-cylinder engine

MEAN CRANK PIN LOADS IN 6 AND 12 CYL. ENGINES

	VERTICAL FORCES						HORIZONTAL FORCES					
A_1-A_2	GAS PRESS	INERTIA	CENTRIFUGAL ROD	CENTRIFUGAL CRANK	NET PIN	NET B'RNG	GAS PRESS	INERTIA	CENTRIFUGAL ROD	CENTRIFUGAL CRANK	NET PIN	NET B'RNG	RESULTANT (PIN)
0-30	$-P'_{m1}$ =	I_{m1} =	C_{m1} =	C'_{m1} =		V_1	$P'_{m1} \times h_1$ =	$-I_{m1} \times h_1$ =	C_{m3} =	C'_{m3} =		H_1	
30-60	$-P'_{m2}$ =	I_{m2} =	C_{m2} =	C'_{m2} =		V_2	$P'_{m2} \times h_2$ =	$-I_{m2} \times h_2$ =	C_{m2} =	C'_{m2} =		H_2	
60-90	$-P'_{m3}$ =	I_{m3} =	C_{m3} =	C'_{m3} =		V_3	$P'_{m3} \times h_3$ =	$-I_{m3} \times h_3$ =	C_{m1} =	C'_{m1} =		H_3	
90-120	$-P'_{m4}$ =	$-I_{m4}$ =	$-C_{m3}$ =	$-C'_{m3}$ =		V_4	$P'_{m4} \times h_3$ =	$I_{m4} \times h_3$ =	C_{m1} =	C'_{m1} =		H_4	
120-150	$-P'_{m5}$ =	$-I_{m5}$ =	$-C_{m2}$ =	$-C'_{m2}$ =		V_5	$P'_{m5} \times h_2$ =	$I_{m5} \times h_2$ =	C_{m2} =	C'_{m2} =		H_5	
150-180	$-P'_{m6}$ =	$-I_{m6}$ =	$-C_{m1}$ =	$-C'_{m1}$ =		V_6	$P'_{m6} \times h_1$ =	$I_{m6} \times h_1$ =	C_{m3} =	C'_{m3} =		H_6	
180-210		$-I_{m6}$ =	$-C_{m1}$ =	$-C'_{m1}$ =		V_7		$-I_{m6} \times h_1$ =	$-C_{m3}$ =	$-C'_{m3}$ =		H_7	
210-240		$-I_{m5}$ =	$-C_{m2}$ =	$-C'_{m2}$ =		V_8		$-I_{m5} \times h_2$ =	$-C_{m2}$ =	$-C'_{m2}$ =		H_8	
240-270		$-I_{m4}$ =	$-C_{m3}$ =	$-C'_{m3}$ =		V_9		$-I_{m4} \times h_3$ =	$-C_{m1}$ =	$-C'_{m1}$ =		H_9	
270-300		I_{m3} =	C_{m3} =	C'_{m3} =		V_{10}		$I_{m3} \times h_3$ =	$-C_{m1}$ =	$-C'_{m3}$ =		H_{10}	
300-330		I_{m2} =	C_{m2} =	C'_{m2} =		V_{11}		$I_{m2} \times h_2$ =	$-C_{m2}$ =	$-C'_{m2}$ =		H_{11}	
330-360		I_{m2} =	C_{m1} =	C'_{m1} =		V_{12}		$I_{m1} \times h_1$ =	$-C_{m3}$ =	$-C'_{m3}$ =		H_{12}	
360-390		I_{m1} =	C_{m1} =	C'_{m1} =		V_{13}		$-I_{m1} \times h_1$ =	C_{m3} =	C'_{m3} =		H_{13}	
390-420		I_{m2} =	C_{m2} =	C'_{m2} =		V_{14}		$-I_{m2} \times h_2$ =	C_{m2} =	C'_{m2} =		H_{14}	
420-450		I_{m3} =	C_{m3} =	C'_{m3} =		V_{15}		$-I_{m3} \times h_3$ =	C_{m1} =	C'_{m1} =		H_{15}	
450-480		$-I_{m4}$ =	$-C_{m3}$ =	$-C'_{m3}$ =		V_{16}		$I_{m4} \times h_3$ =	C_{m1} =	C'_{m1} =		H_{16}	
480-510		$-I_{m5}$ =	$-C_{m2}$ =	$-C'_{m2}$ =		V_{17}		$I_{m5} \times h_2$ =	C_{m2} =	C'_{m2} =		H_{17}	
510-540		$-I_{m6}$ =	$-C_{m1}$ =	$-C'_{m1}$ =		V_{18}		$I_{m6} \times h_1$ =	C_{m3} =	C'_{m3} =		H_{18}	
540-570	$-P'_{m7}$ =	$-I_{m6}$ =	$-C_{m1}$ =	$-C'_{m1}$ =		V_{19}	$-P'_{m7} \times h_1$ =	$-I_{m6} \times h_1$ =	$-C_{m3}$ =	$-C'_{m3}$ =		H_{19}	
570-600	$-P'_{m8}$ =	$-I_{m5}$ =	$-C_{m2}$ =	$-C'_{m2}$ =		V_{20}	$-P'_{m8} \times h_2$ =	$-I_{m5} \times h_2$ =	$-C_{m2}$ =	$-C'_{m2}$ =		H_{20}	
600-630	$-P'_{m9}$ =	$-I_{m4}$ =	$-C_{m3}$ =	$-C'_{m3}$ =		V_{21}	$-P'_{m9} \times h_3$ =	$-I_{m4} \times h_3$ =	$-C_{m1}$ =	$-C'_{m1}$ =		H_{21}	
630-660	$-P'_{m10}$ =	I_{m3} =	C_{m3} =	C'_{m3} =		V_{22}	$-P'_{m10} \times h_3$ =	$I_{m3} \times h_3$ =	$-C_{m1}$ =	$-C'_{m1}$ =		H_{22}	
660-690	$-P'_{m11}$ =	I_{m2} =	C_{m2} =	C'_{m2} =		V_{23}	$-P'_{m11} \times h_2$ =	$I_{m2} \times h_2$ =	$-C_{m2}$ =	$-C'_{m2}$ =		H_{23}	
690-720	$-P'_{m12}$ =	I_{m1} =	C_{m1} =	C'_{m1} =		V_{24}	$-P'_{m12} \times h_1$ =	$I_{m1} \times h_1$ =	$-C_{m3}$ =	$-C'_{m3}$ =		H_{24}	

MEAN RESULTANT ON CRANK PIN → F_m =

CONSTANTS

WT. OF RECIPROCATING PARTS, W_r = _____ CRANK THROW, IN., r = _____ ENGINE R.P.M. N = _____

CONN. ROD, BIG END, W_c = _____ CONN. ROD LENGTH, IN, ℓ = _____

EQUIVALENT CRANK PIN, W_e = _____ PISTON AREA, SQ. IN., a = _____

VALUES FOR TABULATION

1. INERTIA

$A = .0000284\, W_r r N^2$ = _____

$I_{m1} = A(.955 + .826\, r/\ell)$ = _____

$I_{m2} = .698\, A$ = _____

$I_{m3} = A(.256 - .826\, r/\ell)$ = _____

$I_{m4} = A(.256 + .826\, r/\ell)$ = _____

$I_{m5} = .698\, A$ = _____

$I_{m6} = A(.955 - .826\, r/\ell)$ = _____

2. CENTRIFUGAL

$C = .0000284\, W_c r N^2$ = _____

$C' = .0000284\, W_e r N^2$ = _____

$C_{m1} = .955\, C$ = _____

$C_{m2} = .698\, C$ = _____

$C_{m3} = .256\, C$ = _____

$C'_{m1} = .955\, C'$ = _____

$C'_{m2} = .698\, C'$ = _____

$C'_{m3} = .256\, C'$ = _____

3. HORIZONTAL COMPONENT OF PRESSURE & INERTIA

$h_1 = \frac{2\ell}{r}\left[1 - \sqrt{1 - \frac{r^2}{4\ell^2}}\right]$ = _____

$h_2 = \frac{2.37\ell}{r}\left[\sqrt{1 - \frac{r^2}{4\ell^2}} - \sqrt{1 - \frac{3r^2}{4\ell^2}}\right]$ = _____

$h_3 = \frac{7.50\ell}{r}\left[\sqrt{1 - \frac{3r^2}{4\ell^2}} - \sqrt{1 - \frac{r^2}{\ell^2}}\right]$ = _____

Fig. 5

weights must be separately tabulated, following the same procedure, and the net mean forces due to them, on each bearing, must be calculated in the same manner as for the crankpins. These are then added to the net mean forces for each interval at each bearing obtained for the uncounterweighted shaft.

The method and phasing for a five-bearing shaft with eight counterweights is shown in the table (Fig. 4) for the center main bearing.

Since the counterweights are symmetrically disposed on either side of the center bearing only the effect on one side need be considered, the result being doubled to get the net effect. Since 45 deg. intervals are used there are but two mean values of vertical and horizontal component of centrifugal force per counterweight which occur in each quadrant.

Similar tabulations are of course required to obtain the effect of counterweights on the other bearings. It must be remembered that the phase relation of the counterweights with respect to the throws must correspond to that used in tabulating the crankpin forces on the same bearing. The most convenient way is to tabulate the counterweight reaction side by side with those of the crankpin forces so that the net force may be obtained in one operation.

This method is equally adaptable to the V-type engine. In this case the crankpin load is obtained by the addition of like force components of the two cylinders operating on the same pin, in proper phase relation. The main bearing loads are then determined in exactly the same way as in the case of the straight line engine. The choice of unit intervals depends only upon the phase relation of the crank-throws, being 30 deg. for the six-throw, and 45 deg. for the four or eight-throw crankshaft.

A table for the computation of net mean resultants on crankpins for a six-cylinder engine is also given here to illustrate the application of the method to a type of engine requiring 30 deg. intervals (Fig 5).

The error involved in the use of this method is well within the limits of variation in the conditions necessarily assumed. The following results illustrate the closeness of agreement with the conventional laborious method of determination and the difference in error involved in extending the length of crank interval in the two methods. The example used was a three-bearing six-cylinder engine.

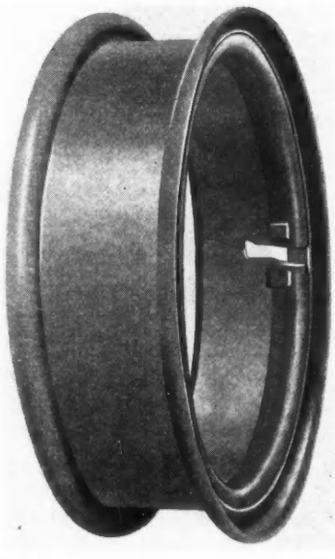
Unit Interval Deg. Crank Angle	Mean Load by Polar Diagram	Mean Load by New Method
(Crankpin at 1800 r.p.m.)		
15	690	....
30	670	675
45	640	660
(Crankpin at 3000 r.p.m.)		
15	1420	....
30	....	1390
45	....	1360
(Center main at 3000)		
15	2700	....
30	....	2611

The time required to determine bearing pressure by this method, using the organized chart, has been found to average 45 minutes per bearing, given all the required constants which must be known regardless of the method used. Furthermore the determination is fully automatic, requiring merely the substitution of the known values called for in the computations and chart.

It is felt that this method should make it unnecessary to slight the important question of bearing pressures in engine design, either by entire neglect or by the use of so-called "short-cuts" which vitally sacrifice accuracy and value for the sake of speed.

Goodyear Presents New Line of K-Rims

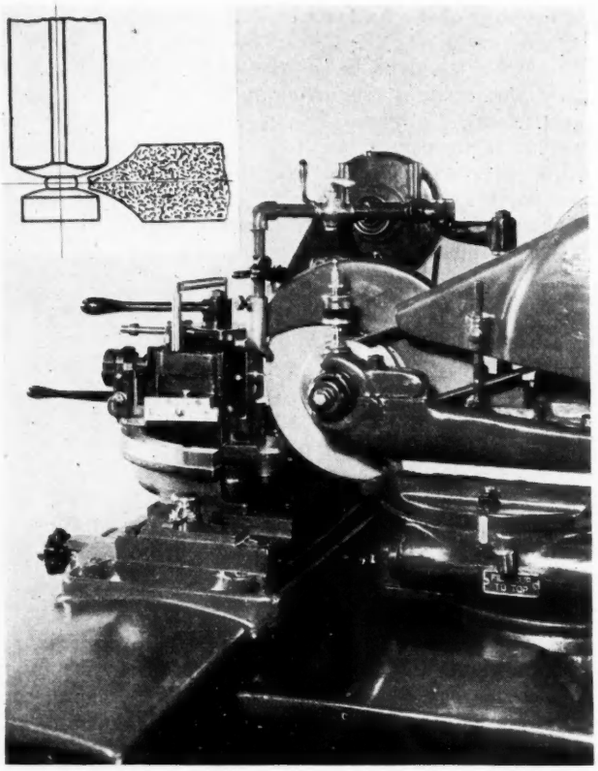
GOODYEAR has started manufacture of a complete new line of K-rims having a 28 deg. mounting bevel which will interchange on the same wheels with Firestone BO, DTI and R rims using the 28 deg. single bevel mounting. The new rim, which will be known as the K-28, will have all the distinctive features of the present type K-rims.



Standardizing mountings of single bevel demountable rims similar to those manufactured by the Firestone and Goodyear companies followed an offer by Goodyear during the last annual meeting of the N.A.C.C.

The K-18 rims made by Goodyear, having a single 18 deg. bevel which were recently refined are interchangeable on the same rims with K-rims. Goodyear will continue to furnish its changeover equipment with K-18 rims felloe bands and accessories.

BULLETIN NO. 81 of the National Research Council, just published in its fourth edition, by the National Research Council of the National Academy of Sciences, Washington, D. C., is a directory of industrial research laboratories in the United States, including consulting research laboratories.



Once the stops are correctly set for subsequent truing it is only necessary to index the swiveling member to the three different positions + + + + + + + +

Formed Wheel Truing Device

Ingenious device trues three radii, two sides and the face of a grinding wheel and can be adapted to many similar jobs

AN ingenious device for truing three radii (the two sides and the face of a grinding wheel) was designed recently by Brown & Sharpe Mfg. Co. While built for a particular job, dressing the wheel that grinds a notch in the end of a needle valve (see illustration), this device can be adapted to many jobs having similar requirements. It consists of a base bolted to the table of the machine in which is mounted a swiveling member. Three positive positions are provided for this member, each being a position from which one truing operation on the wheel is done. A diamond tool holder is carried on a pair of slides, mounted on the swiveling member. These slides are at right angles to each other, giving the holder both longitudinal and transverse movements. A follower forms a part of the slides and by means of spring tension is kept in contact with a radius former. As the slides carrying the diamond are moved back and forth by a hand lever, along the contour of the former, the diamond travels in a path parallel to the contour of the former.

The swiveling member is set in the central position and by means of a gage the diamond point and former are adjusted so that they are in proper alignment. The diamond is then placed at approximately the center of the grinding wheel face by using the machine table handwheel, and the table stop is set so that the diamond can be correctly relocated for subsequent truings.

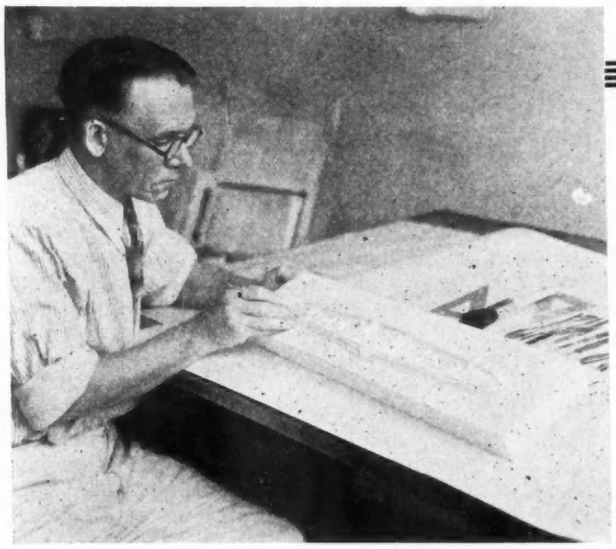
The device is then indexed by a hand lever to either the right or left position, and the side of the wheel is dressed by feeding in the wheel, using the cross feed of the machine and swinging the diamond across the wheel by means of the upper hand lever. When the dressing of one side is completed, the cross feed stop is set. The wheel is then moved away from the diamond and the device swung to the other side. In this position the opposite side of the wheel is dressed in a similar manner, until the cross feed comes up to the stop. Then the swiveling member is indexed to the central position (Fig. 2) and the wheel fed in, meanwhile moving the diamond across the face, until the face is dressed to the correct width. A second stop on the cross feed is then set.

Once these stops are correctly set, for subsequent truing of the wheel it is only necessary to index the swiveling member to the three different positions, dressing the wheel from each position by coming up to the cross feed stops, as their relative position does not change as the wheel is worn.

THE process of anodic oxidation of aluminum, by which the metal is provided with a corrosion-resisting coating, has been practiced in this country for some years now. It consists essentially in making the article to be coated the anode in an electrolytic bath of chromic acid and sending a current through the bath. The coating thus formed on the aluminum consists of aluminum oxide. As the layer of oxide is formed the resistance of the bath to the passage of the current increases, from which the inference might be drawn that the oxide coating is an electrical insulator. It has now been discovered in Germany that coatings of sufficient insulating value can be formed in this way to make unnecessary the use of any other insulating material for wires used in electrical apparatus such as transformers. In certain cases the coils are being baked in insulating compositions, but the object of these compositions is said to be merely to hold the wires in position.

THE French State Railways have placed an order for ten railcars to be fitted with gasoline engines of 110 hp. It is planned to replace these gasoline engines later with heavy oil engines. Evidently no suitable oil engines of the power required are available in France at the present time.

PRODUCTION LINES



Sample instrument mounting panels are now shaped in clay from hand-cut plaster molds at the AC Spark Plug Co. plant. Harlow H. Curtice, president of AC, worked out the idea, which saves four-fifths of time formerly used in turning out metal sample

Reward the Savers

G. Charter Harrison (who invented standard costs years ago) told the S.I.E. last week how standard costs increase profits. Interesting to hear how standard cost system approaches the principles on which some of the budgets of the automotive industry are designed, or vice versa. To us, the most important thing he said was this business of incentive for key men in the factory. He referred to the foreman, particularly. Sold us on the good will and actual dollars and cents return through this simple device. The right kind of incentive should be measured by definite standards, preferably on the basis of percentage of saving in his department.

Give 'Em a Chance

W. H. McCoy (manager, machine shop division G.M.R.), than whom there is no better expert on tungsten carbide, makes some pointed comment on grinding. He asked us to quote the following from his recent paper: "We believe that if the users of high-speed steels and alloys would have as much patience and be in sympathy with tungsten carbide to the same degree as is given the former, a much greater saving in the cost of production could be accomplished." Further, he recommends careful handling and a centralized tool room for tungsten carbide tools exclusively. What is more important, the tool room should be run by a competent man who understands his job.

Versatile Tools

Flexibility in production is certainly a desirable goal. For certain kinds of work, particularly drilling, reaming and tapping, some factories are turning to standard single spindle machines. Equipping these with interchangeable multiple spindle heads. Simply by changing the head, a different kind of job can be put through the same machine. The machine usually is a drill press or horizontal boring mill of rugged construction and has plenty of horse power. There seems to be no end to the number of spindles they can use.

Quantity vs. Economy

Remember about a year ago the interest aroused in economic production lots for intermittent production. Fairfield E. Raymond (professor industrial research M.I.T.) kept the ball rolling in papers read before the A.S.M.E. and the S.A.E. He has just written a book, "Quantity and Economy in Manufacture," which buttons up all angles of the subject. It gives a very good definition of the economic production quantity. The book has been divided into three parts. The first is for the busy executive. It gives the main facts, states some of the simple formulas, and solves practical examples. The second part goes into the theory and discusses all the elements individually. This section develops the fundamental formulas and shows how they may be simplified. The last section is a complete mathematical analysis of the work in the book and will satisfy the fellow who is curious about the whys and wherefores. Published by McGraw-Hill Book Co., 375 pp., $4.00 net.

Cadillac Adds Arc Furnaces

Electric arc furnaces are becoming more and more essential in automotive production. Cadillac has just installed for electric rocking arc furnaces of 5000 lb. capacity each. Capacity of 120 tons daily for brake drums, clutch plates and cylinder blocks.

Steel Mills Standardize

To simplify and standardize wide flange structural steel sections, the manufacturers (Bethlehem Steel Corp., Carnegie Steel Co., Illinois Steel Co.) have made some big revisions. There has been a reduction in the number and weight of sections and elimination of overlapping groups. The product of each mill will be as nearly interchangeable as mill conditions will permit. Revised series of CB sections, plus other information, covering standard rolled sections is given in the new 1931 abridged edition of the Carnegie Pocket Companion. Now off the press.—J.G.

MANUFACTURING MANAGEMENT METALLURGY

Comparator Type Inspection Gages To Maintain Close Tolerances

IN an industry where close tolerances are the rule rather than the exception and 100 per cent inspection an essential in many cases, the problem of inspection cost compatible with requisite quality is serious indeed. Answering this challenge, progressive manufacturers are adopting the newer types of inspection devices, some of which are just emerging from the laboratory stage. The most promising development in this direction is found in the comparator type of inspection devices offered for practically every kind of measurement. And the most striking of these are some optical devices which are finding favor today.

It was, therefore, a decided pleasure to study some direct applications of these as employed by the Reo Motor Car Co. Because of the close tolerances that characterize Reo production and the insistence upon many 100 per cent inspections, the inspection department is constantly seeking the latest development in the field. The few examples described in this article show an unusual variety. As will be evident later, each was chosen primarily because of inherent accuracy since it is axiomatic that the gaging device must be much more accurate than the limits which it is to check. In addition, these instruments are fool-proof to a marked degree and often permit gaging so rapidly as to materially reduce inspection cost.

Although it is not specifically described in this article, Reo also has one of the finest gage inspection departments in the industry. The equipment consists of Carl Zeiss optical measuring machines such as the universal measuring machine, optimeter, dividing head and many others. This laboratory checks all primary gages and assures the accurate setting of the inspection devices discussed here.

Not so long ago optical measuring instruments were purely laboratory instruments and not many thought of using them in production. But the situation has changed. Fig. 1 shows the Carl Zeiss optimeter used at Reo for inspecting the piston pin outside diameter. It is primarily a comparator and the zero setting is made with gage blocks. In the illustration the instrument is provided with a projector attachment consisting of a separate lamp and screen giving scale readings directly as shown. The scale is graduated in 0.00005 in. and when magnified the divisions appear 1/16 in. apart. The overall accuracy of the scale is said to be guaranteed within 0.000002 in. Obviously an instrument of such inherent accuracy is well suited to handle close tolerances. The piston pin shown is 0.9834 in. outside diameter and is held within limits of plus or minus 0.0001 in.

Now we come to the Swedish internal diameter gage which is finding wide acceptance in gaging inside diameters. This too is of the comparator type and provides a three-point contact in the bore to assure accurate measurement. The operation shown in Fig. 2 is that of gaging the connecting rod big end. A similar gage is used on the small end. The big end diameter is 2.190 in. held within limits of plus 0.0000 minus 0.0005 in. The diameter of the small end is 0.9838 in. held within limits of plus 0.0000 and minus 0.0005 in.

Another interesting Carl Zeiss instrument is the Passameter caliper gage of the indicating comparator type. As will be noted from Fig. 3, a feature of the gage is three-point contact providing a measure of out-of-roundness, taper, etc., as well as variations in these from the zero setting. The contact anvils are of Widia

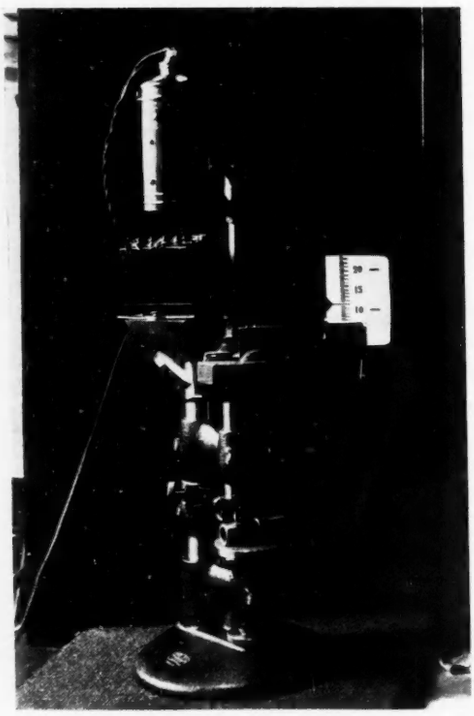


Fig. 1 (above)—Checking piston pin OD within limit of 0.0001 in. over or under with a Carl Zeiss Optimeter. Note that this machine is equipped with a projector attachment + +

Fig. 2 (right)—Swedish internal gage is shown here checking the large and small ends of connecting rods to limits of plus 0.0000 and minus 0.0005 in.

Used by Reo

by
Joseph
Geschelin

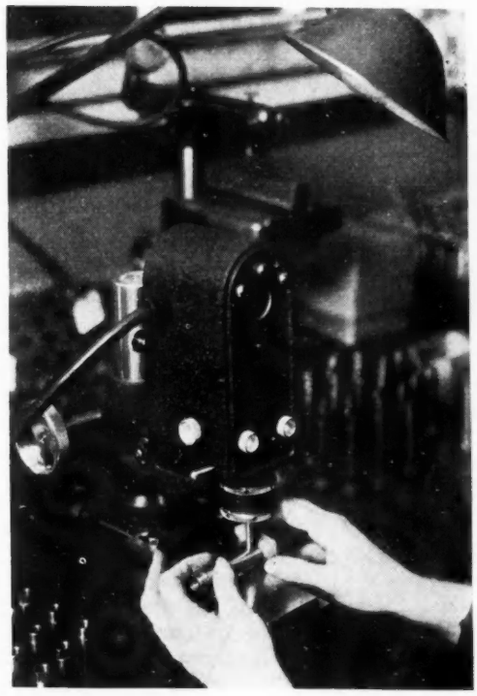
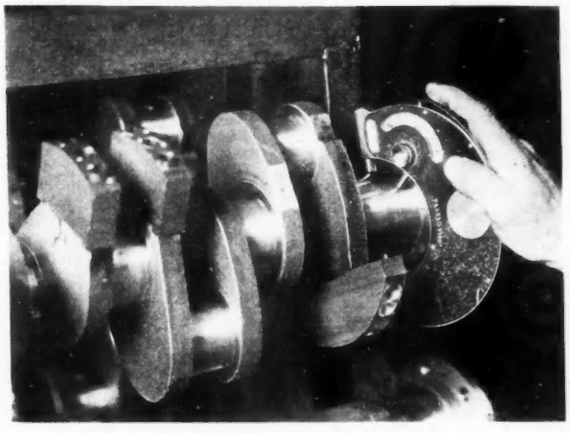


Fig. 4 (right) — Sheffield Reed indicator gage inspecting the OD of valve tappets to limits of over or under 0.0005 in. + +

Fig. 3 (below) — The Passameter caliper gage provides a three-point for accuracy and checking roundness. Tolerance limits are set by two red pointers adjustable externally



to assure permanency and are adjustable for variations in gaging diameters. Tolerance limits are set by means of two red pointers which are movable externally. Fig. 3 shows the operation of checking crankshaft main bearings and pin bearings. The main bearing diameter is 2.625 in. and held to plus 0.0000, minus 0.0010 in. The pin bearing diameter is 2.1875 in. plus or minus 0.0005 in.

Probably the best example of modernity is in the use of the Sheffield gage which was first described in *Automotive Industries*, April 4, 1931, and has been on the market only about two months. This is a comparator but it differs from other types in that the tolerance limits are given by signal lights shown at the top of the instrument. Green at the left indicates undersize; amber at the center indicates correct, and red at the right is oversize. This gage is accurate to 0.00001 in. The operation shown in Fig. 4 is that of checking the outside diameter of valve tappets. The diameter is 0.625 in. limits plus or minus 0.0005 in. The Sheffield gage appears to offer some fine possibilities for many lines of work.

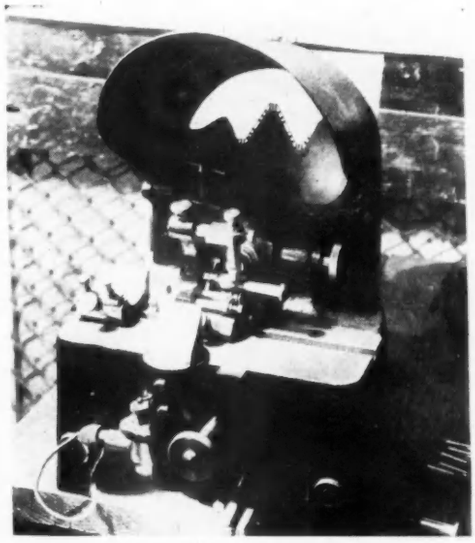
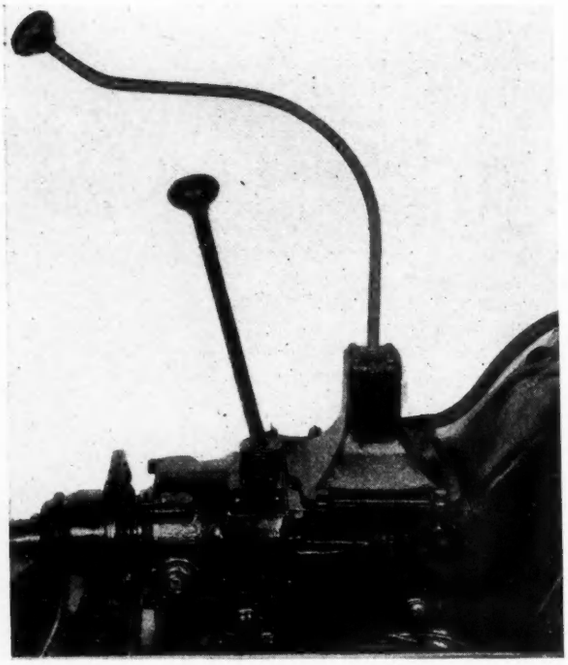


Fig. 5—Connecting rod bolt thread profile is checked against a master on a J & L Hartness comparator. This is an optical projection machine magnifying the work 50 to 100 times + + + + +

To further illustrate the scope of activity at Reo we have shown in Fig. 5 an entirely different type of equipment whose function is quite distinct from that of detail precision measurement. This is the J & L Hartness comparator which is really an optical projection machine. Its widest use is in the field of checking thread profiles, although it is also used for matching all kinds of odd-shaped surfaces such as flat cams against a master outline. This machine is made up of a light source; a condensing lens system for definitely locating the parts being compared; a compound microscope which magnifies the object 50 to 100 times; and a tolerance chart on which the magnified data is received. The outline of the parts to be gaged is projected on the tolerance chart which represents the maximum and minimum outline drawn to represent the permissible variation. The setup in Fig. 5 is for checking the thread profile of connecting rod bolts. This is a 100 per cent inspection and assures full close-fitting threads. Naturally the controlling dimensions of the thread are checked with accurate thread gages.

This brief outline shows the possibilities of economical inspection despite the hurdle of 100 per cent inspection and fine tolerances. It is quite obvious that the comparator gage in general and optical devices in particular have many valuable advantages that the production man must not overlook. Only by taking advantage of the latest advances in the art can inspection cost be kept in line with other economies.



Front compartment of a Hudson eight sedan, showing the location of the free wheeling clutch control lever, and the new shape of main gearshift lever to provide clearance for the additional control + + + + + +

Hudson-Essex Now Offers Selective Free Wheeling

THE Hudson Motor Car Co. is now offering "selective" free wheeling on both the Essex and Hudson models at $35 extra cost. The over-running clutch mechanism is incorporated in a separate housing, bolting to the rear of the transmission. The clutch itself is of the roller type and similar in design to the Warner Gear Co. free wheeling unit used between second and third speeds in a number of other makes of cars.

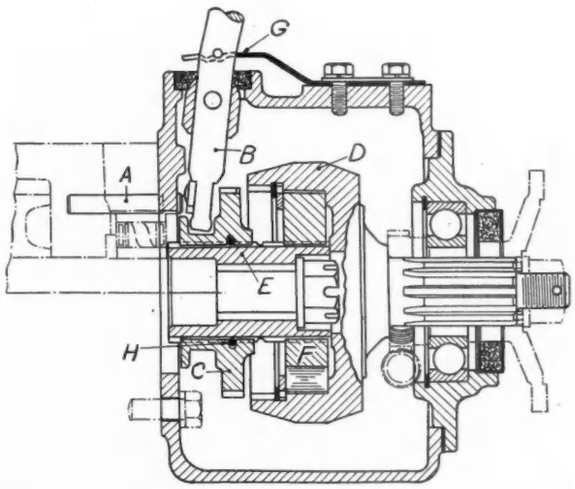
In the Hudson-Essex design the location of the unit provides for free wheeling in all three forward speeds. When shifting into reverse, the free wheeling unit is automatically locked out, and it is brought back into the free wheeling position by means of a separate control lever mounted just back of the main gearshift lever. The latter has been curved up and then back to provide the necessary clearance for the additional control lever.

A sectional view of the free wheeling unit is shown herewith. The unit bolts directly against the rear of the gear box on both the Hudson and Essex. The sectional dotted line directly in front (at the left) of the unit shows the rear Hyatt bearing in the Hudson transmission and part of the low-and-reverse sliding gear. When this sliding gear is shifted backward into reverse, the face of the gear comes in contact with pin A, which latter pushes against the shift lever B and automatically throws the lock-up gear C into mesh with the free-wheel member D. When this action takes place the drive is the same as when no free wheeling device is fitted. This, of course, is necessary in reverse, in order to obtain a drive.

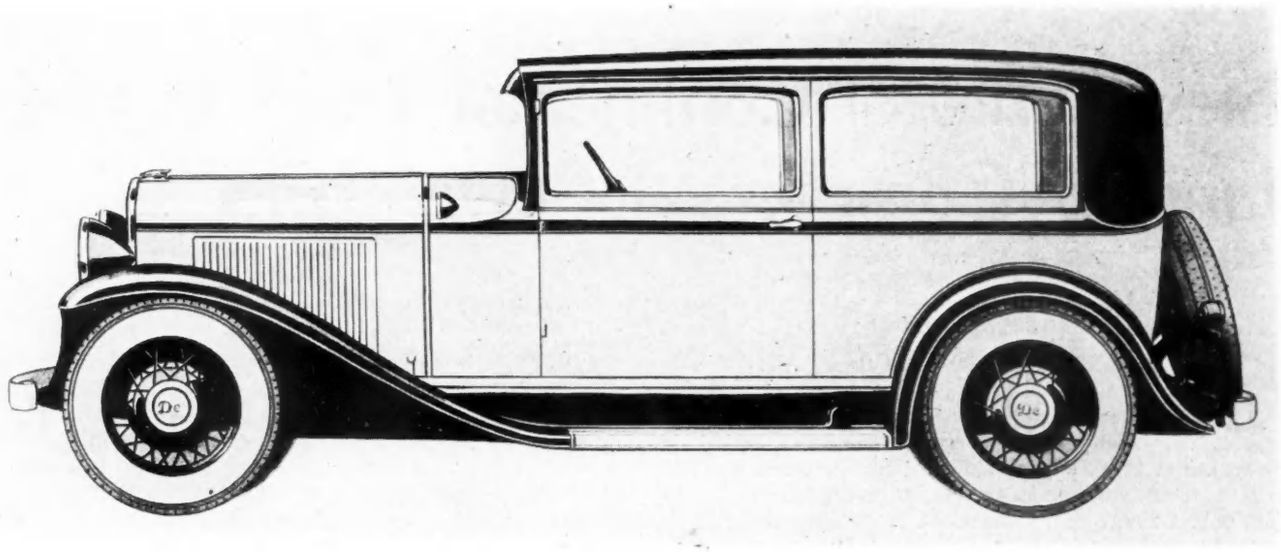
Sleeve E is bolted directly to the transmission main shaft, serving as a driving member. This sleeve is splined on the outside, and the lock-up gear C and the driving or cam member F of the free wheeling unit is mounted on the rear end of this splined sleeve. The drive is then taken from the cam member through six rolls which are constantly held in the driving position by a shoe back of each and a spring applying pressure to this shoe.

The lock-up gear is actuated by the driver by a fore-and-aft movement of the shifting lever, this lever acting directly on the lock-up gear, instead of through the conventional shifter rail and fork. This assures direct action without lost motion. Part G is a flat spring which positions the lever in neutral with regard to the groove in the lock-up member, a pin passing through the control lever and seating in the indentations in the flat spring. The lock-up gear is positioned in the sliding sleeve by a small lock-ring spring H.

There is considerable clearance in the width of the shifting groove of the lock-up gear so that no rub will be encountered between the bottom of the lever and that gear when the car is in motion. This again is the reason for the flat positioning spring G on the top of the case, before noted. This flat positioning spring can be adjusted on the unit fore and aft so that the bottom of the lever will show a clearance of 0.050 in. on each side of the groove at all times. This adjustment is made by loosening the two set screws and moving the flat spring fore and aft as desired.



Detail showing the mounting of the free wheeling clutch assembly at the rear of the transmission on Hudson and Essex cars. The over-running clutch is of the multiple Warner-Gear roller type and provides free wheeling in all forward speeds at the option of the driver. Extra cost is $35 on both chassis + + + + + + +



The De Soto six de luxe sedan is offered at $695

De Soto Broadens Its Line With New Six and Eight Models

WITH the announcement of a two-door Sedan listing at $695, the De Soto Motor Corp. presents the lowest priced six-cylinder model ever offered by a unit of the Chrysler Corp. Standard equipment includes wire wheels, exterior sun visor, hydraulic shock absorbers, dash gasoline gage, engine temperature indicator, etc. Both individual front seats have folding backs.

At the other end of the price range, De Soto is announcing a de luxe sedan on the six-cylinder chassis, and a line of de luxe bodies on the eight. These de luxe eights are offered at no increase in price, ranging from $965 to $1,065, while the new six sedan is slightly higher in cost, at $825.

Distinguishing features of the new de luxe line include a new radiator cap based on a reproduction of Hernando De Soto; striping on the sun visor; fenders and sheet metal finished to match body colors; draw shades on rear quarter windows; improved interior lining and carpet finish; wider upholstery pleats; luxury type springs in all closed model seat cushions and backs; seat upholstering material on the sidewalls; smoking sets in the sedans; rear quarter lights; polished chrome-plated door sill plates; cowl panels covered with carpeting; screens on side cowl ventilators; rear view mirror bracket, gearshift lever, hand brake lever, and gas tank filler cap are chrome-plated.

Mechanical improvements in the De Soto six, in addition to those recently mentioned in these columns, include a five point engine mounting similar to that now used on the Chrysler eight. A central support at the rear, approximately under the rear main bearing, takes the load on a rubber cushion, while at the sides soft rubber blocks insulate the engine from the frame. Counterweighted crankshafts were recently announced.

In the De Soto six de luxe sedan refinements include a radiator similar to that used on the de luxe eights, a new sun visor, two top cowl ventilators, addition of assist cords and robe rail cord to match. Front seat risers are covered with body cloth; a velvet carpet is used; foot rests are carpet covered; a door pocket has been added in the right rear door; garnish molding aprons have been added; the dome light switch has been moved to the door post; luxury type springs are used in seat backs and cushions.

Chrome-plated scuff plates, windshield frames, steering post brackets, gear shift lever, hand brake lever and tank filler cap are found on the de luxe six sedan as well as on the eight-cylinder models.

Schwingungen in Automobillenkungen (Shimmy)

A report from the Motor Vehicle Experimental Institute and Rigidity Laboratory of the Berlin Technical High School, by Gabriel Becker, Hans Fromm and Herbert Maruhn. Published by M. Krayn, Berlin.

THIS volume deals with the results of a very extensive investigation of the general subject of shimmy, including both a theoretical analysis and experimental work. It contains the following chapters: The Vibratory System; Principles of the Science of Vibration; Explanation of the Mode of Vibration by Experiments; The New Cross Steering with Compensation of the Gyroscopic Moments of the Steered Vehicle Wheels; Explanation of the Mode of Vibration by Analysis, and The Vibration Analyzer. The problem of front-end resistibility has been attacked in a thorough manner, with financial assistance from the German government, and the book should certainly be of value to anyone who has to deal with shimmy problems.

New Series of Continental Truck Engines Line of Commercial Powerplants

CONTINENTAL MOTORS CORPORATION is introducing a new line of L-head, six-cylinder commercial vehicle engines, designated the E-600 series, which fit in between the 16-C 248-cu. in. six-cylinder truck engine and the valve-in-head R series, which latter range up to 428 cu. in. in displacement. The new series range in displacement from 288.3 to 382.9 cu. in., and while displacements of some of the models overlap those of the R series, they are not intended to replace the latter but to be supplementary to them.

There are four models in the new series, E-600 to E-603. The major difference between them is in the bores, the strokes of all being 4½ in. Bores range from 3 11/16 to 4¼ in., so the stroke/bore ratio in each case is comparatively low. One advantage of the short-stroke type is that it permits the use of ample lengths for all of the seven main bearings of the crankshafts, and the shortest bearing has a length of 1 9/16 in. Continental Motors engineers point out in this connection that it is the bearing length rather than the bearing diameter on which long bearing life mainly depends, as long bearings tend to keep down the oil temperature. The use of a short stroke also has permitted the provision of valves that are relatively large for the displacement, with ample water jacketing and ample water capacity generally.

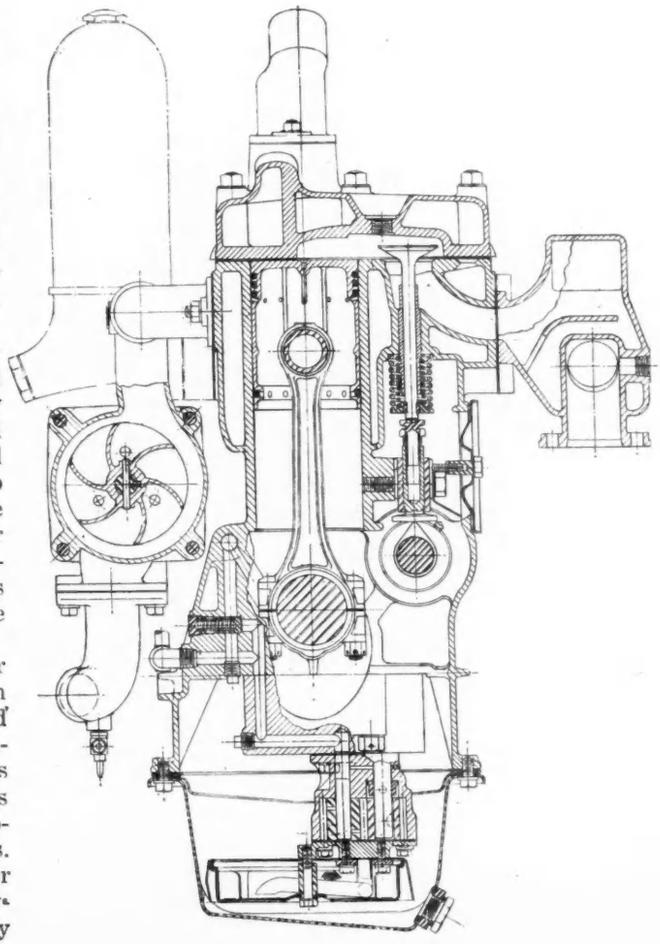
An offset type of combustion chamber has been developed by Continental for these engines, with a small clearance space over the piston, and relatively high turbulences characteristic for the chamber proper. Maximum torque, rather than maximum horsepower, has been the aim in the E-600 series, however, the latter being limited by the size of manifold that can be used for good economy, good idling characteristics, and quick warm-up.

Regarding the piston design, the length of the bearing surface is to be noted. These pistons are of heat-treated gray iron. Each cylinder is completely surrounded by water. Cooling water circulates between the intake and exhaust valve ports, and there is more than the usual amount of water between the exhaust port and the top of the cylinder barrel. Circulation is in excess of one gallon per minute per horsepower, it is claimed. Water is carried across the block between the two center exhaust valves, which is normally one of the hottest points in an L-head engine. Lubricating is from a gear type pump through drilled passages.

As has been mentioned, manifolding is designed for higher intake velocities than would be used for maximum output. Inlet manifold temperatures also are carried higher than normally, in order to obtain the best all-around operating characteristics. The horsepower is around 0.26 per cu. in., which is considered good for this type of service. Intake manifolds are of the two-port type, as on other Continental six-cylinder engines.

As to accessories, Continental has made provision for mounting the starting motor on either side of the flywheel housing, has provided generator drive capacity for units up to 750-watt capacity, for optional single or dual distributor drive, for either an A.C. or an Evans fuel pump, for a 3-6 cu. ft. air compressor, a centrifugal or gas velocity governor, a thermostat, a full-flow or partial-flow oil filter, an oil cooler, and an air cleaner. Magneto ignition can also be provided, whether or not a generator is carried, but with magneto ignition the generator capacity is limited to 350 watts. Provision is also made for tachometer drive.

Intake manifolds are provided with booster brake connections. The water inlet elbow to the cylinder is provided with a connection for fire pumping engine service. For this service dual ignition cylinder heads will also be available. For four-wheel-drive trucks the oil pan has been made reversible. Hydraulic brake cylinder mounting is provided for on the flywheel housing, and the engines include a crankcase ventilating system.



Rounds Out

Model	E-600	E-601	E-602	E-603
Bore	3 11/16 in.	3 7/8	4 1/8	4 1/4
Stroke	4 1/2	4 1/2	4 1/2	4 1/2
Displacement	288.3	318	360.7	382.9
S.A.E. rating	32.6	36	40.8	43.35
Max. hp.	75-3000	81-2600	89-2400	97-2400
Hp. at 1000 r.p.m.	34	37	44.5	47

Following specifications apply to all above types:

Bare engine weight ..880 lb.

Cylinders .....chrome nickel iron
crankcase .....integral
Pistons .....nickel iron
length .....5 3/16 in.
Piston pins bearing in piston
pin diameter .....1¼ in.

Rings, compression ...three
width .....3/16 in.
Rings, oil, width ....¼ in.

Crankshaft 7-bearing
diameter .....2 5/8 in.

Main bearings, type ..bronze backed babbit
Front, dia. and length 2 5/8 x 1 21/32
center .....2 5/8 x 2 1/16
rear .....2 5/8 x 2½
all others .....2 5/8 x 1 9/16
thrust taken by ....front bearing

Crankpin, dia. and
length .....2 3/8 x 1 13/16
bearing type .....spun in
Conn. rod length .....9 in.

Camshaft bearings ...4
diameters .....1 7/8 to 2 7/16

Valves, intake, dia. ..2 1/16
port diameter 1 13/16
exhaust, head dia. ..1 7/8 in.
port dia. 1 5/8
Angle of seat .....30 deg.
Lift .....3/8 in.
Material, exhaust ..silchrome
intake .....chrome nickel

Cooling pump .....centrifugal
location .....accessories shaft
outlet diameter ....2 in. hose
inlet diameter .....1¾ in. hose

Fan .....20 in. four blade
driven from .....accessories shaft
driven pulley dia. ...6 in.
drive pulley .....5 in.
Fan belt type .....Vee
max. width .....7/8 in.

Oiling system, cap. ..9 qts.
oil pres., normal ...40 lb.

Distributor location ..cylinder head

Starter pinion .....11 teeth

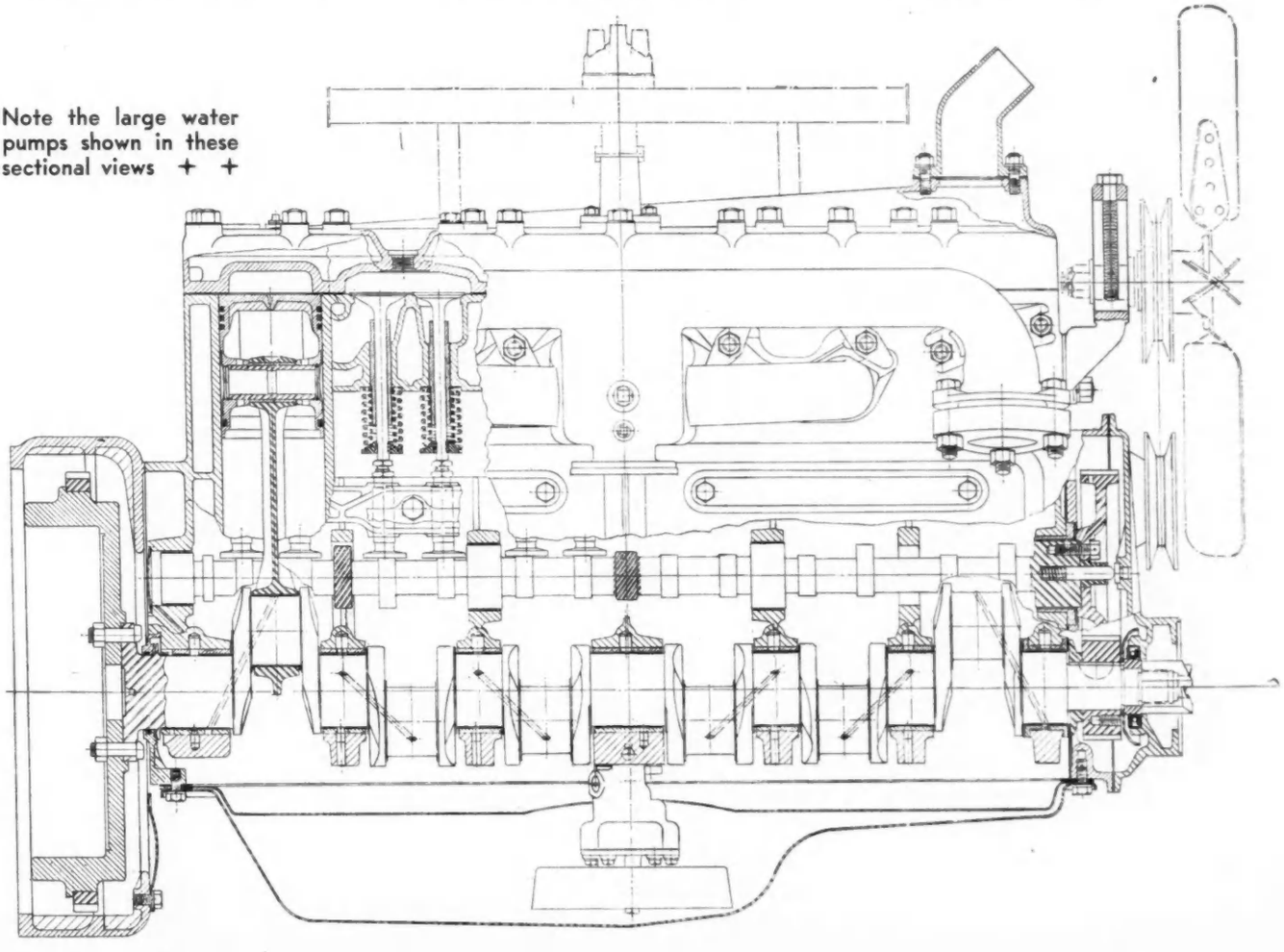
Spark plug types ....18 mm.

Carburetor type .....vertical 1½ in.

Front end drive .....helical gear
crank gear .....30 teeth
idler 52
cam gear 60
accessory gear 20
gear faces .....1½ in.

Mounting type .....three point
rear bolt hole
spacing .....24½ in.
drop below cen-
ter line .....2½ in.
front support .....50 in. trunnion on crankshaft centerline
Flywheel type .....semi-steel
diameter .....15 5/8 in.
max. s.p. clutch
diameter .....13 in.

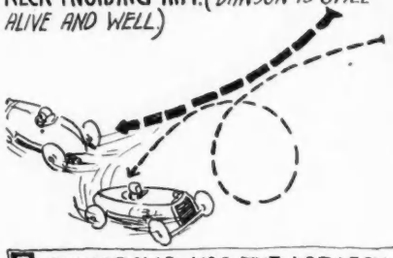
Note the large water pumps shown in these sectional views + +



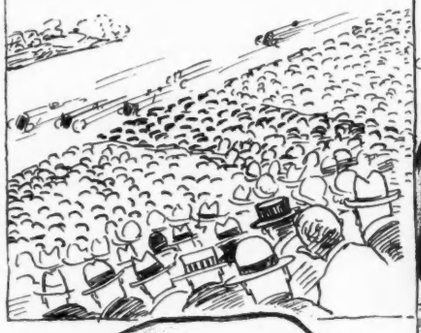
Racing Oddities—By Pete Keenan

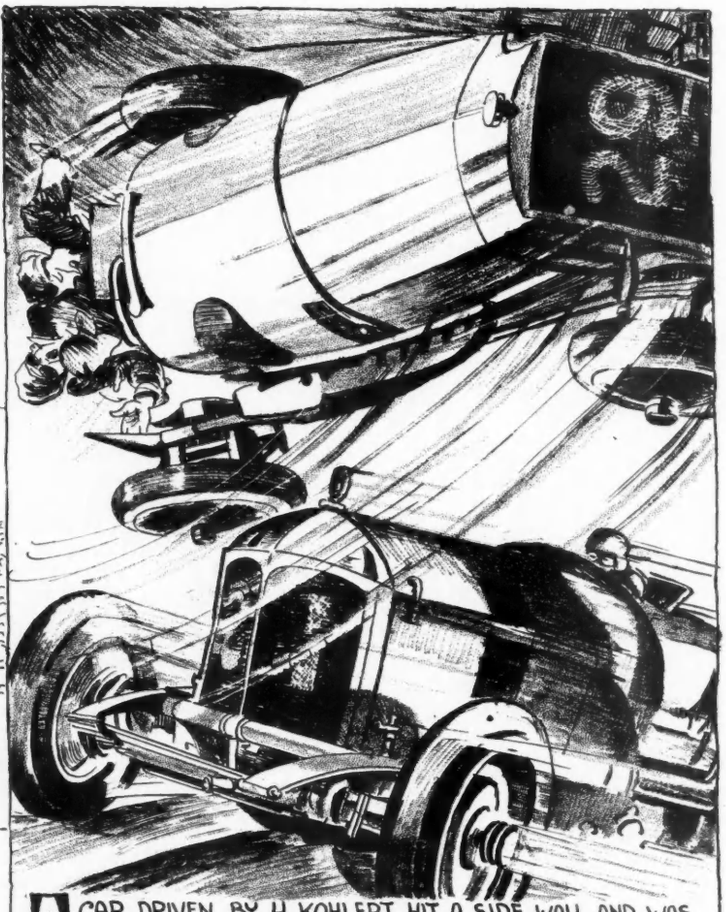
Incidents of the Indianapolis 500-mile Memorial Day Classic

THE VERB "TO DO A GILHOOLEY" ORIGINATED IN 1914 WHEN R.I. GILHOOLEY WENT INTO A SPIN, AND JOE DAWSON 1912 WINNER BROKE HIS NECK AVOIDING HIM. (DAWSON IS STILL ALIVE AND WELL)



INDIANAPOLIS HAS THE LARGEST ATTENDANCE OF ANY SPORTING EVENT IN THE WORLD.

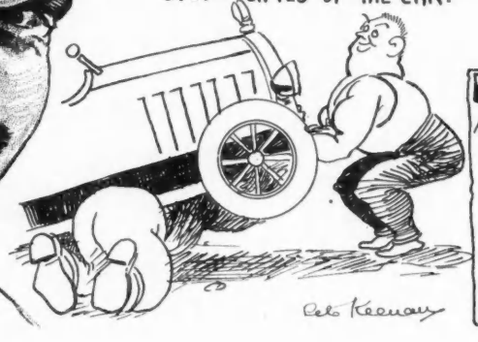




A CAR DRIVEN BY H. KOHLERT HIT A SIDE WALL AND WAS THROWN INTO THE AIR. CLIFF BERGERE, CLOSE BEHIND DROVE THROUGH BENEATH AND ESCAPED. *Indianapolis, 1928.*

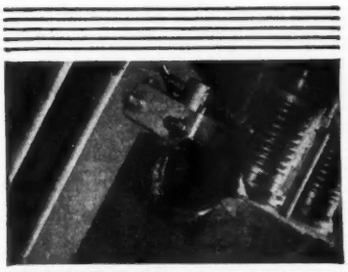
TOMMY MILTON. BLIND IN HIS RIGHT EYE AND ONLY 2/3 NORMAL VISION IN THE OTHER ONE, HOLDS NEARLY 50 SPEED RECORDS — *Steve Hannagan.*

ON A RACE OF 1906. IN FRANCE AN AMERICAN CARRIED A STRONG MAN AS HIS MECHANIC IN CASE OF TROUBLE "BEBE" THE STRONG MAN JUST LIFTED UP THE CAR.



1931 IS RALPH DE PALMAS 12TH INDIANAPOLIS RACE. (HOWS THAT FOR A RECORD?)

THE CAR NOT THE DRIVER, WINS THE INDIANAPOLIS CLASSIC. *According to A.A.A. rules.*



NEWS OF THE INDUSTRY

A.P.I. Asks Aid On Vapor-Lock

Wants Designers of Cars to Eliminate It

NEW YORK, May 28—The directors of the American Petroleum Institute at a meeting last week adopted the following resolution:

"A motor fuel which vaporizes at fairly low temperatures is necessary to give easy starting and quick acceleration. If motor fuel in its path through the pipe from the tank to the carburetor is overheated as by leading the pipe too close to the exhaust line, then the fuel may boil in the pipe and the vapor so formed arrest the flow of the liquid fuel. This reduces the power and may stop the engine.

"The public is entitled to motor fuel of maximum efficiency as regards starting and acceleration and the petroleum industry as the result of research and installation of adequate equipment is prepared to furnish motor fuel meeting these requirements. The public is prevented from enjoying the full realization of these improvements because of unnecessary limitations imposed by errors in design of a substantial proportion of automotive vehicles of all types.

"Without cost, minor changes in design will remove this limitation on the use of these desirable fuels. Therefore, be it resolved, that the board of directors of the American Petroleum Institute solicit the cooperation of the board of directors of the National Automobile Chamber of Commerce and the council of the Society of Automotive Engineers in bringing this situation to the attention of the automotive industry."

Hudson Adds Type

DETROIT, May 28—The Hudson Motor Car Co. announced today the addition of a de luxe brougham body type on the 126 in. chassis. The list price will be $1,375.

CHICAGO police took a day off to count the number of automobiles entering the Loop district in a 24 hr. period . . . this year's count made approximately 150,000, against count of 153,629 made 2 yrs. ago . . . wonder if the difference is due to direct mortality or only fright * * * And while we're in the mood: Chicago has also installed on six street corners the kind of traffic control which permits the pedestrian to press a button and turn on a red light to stop traffic while he crosses the street . . . device won't be complete until it is equipped with a powerful magnet to pick up stray slugs which may be flying about * * * Continental Aircraft has bought a Waco Model C, which will be used for demonstrations of Continental aero engines, and general transportation of Continental executives * * * All Franklin dealers are dividing their sales forces into two groups . . . old timers and new timers, according to the length of service of the individual salesman. The two groups will compete for sales volume up to the end of June. Nothing is said about the prizes to be offered * * * It took 45,000 gal. of gasoline and 4500 gal. of lubricants for the First Provisional Air Division of the Army Air Corps to show Chicago how airplanes do their stuff in mass formation * * * Out at Muroc Dry Lake in California a Willys six roadster set up five new American Class C stock car speed records under AAA supervision . . . the best time for the mile (flying start) was an average of 70.692 m.p.h. for a northbound and southbound run * * * the Illinois Commerce Commission received for decision this week the first dispute over a certificate of necessity or public convenience brought by commercial airlines . . . Century Airlines applied for the certificate between Chicago and St. Louis . . . application opposed by American Airways on behalf of its operating subsidiary, Universal Air lines . . . American will withdraw its objection if its subsidiary is also granted a certificate * * * Harry F. Guggenheim of the Foundation, was scheduled to arrive in Cuba May 22 to resume his duties as ambassador to the Republica * * * Fred Duesenberg has said that he is going to sell all his racing cars and leave the game to the younger men * * * William B. Stout of the Stout Aviation Laboratories told the University of Michigan Aeronautical Society last week that the next problem of the aviation industry is to build a plane that will please John Q. Public, and particularly Mrs. John Q. Public * * * Vesta Battery is negotiating with Consolidated Battery for consolidation in a new corporation to be known, when-as-if, as Vesta-Consolidated Corp. * * * Automotive Engine Rebuilders report that depression is giving them more business . . . oh paradox.—H. H.

THE NEWS TRAILER

April Sales Are Seasonally Good

Ford Apparently Regains Position

PHILADELPHIA, May 28—April registrations of new passenger cars are estimated at 264,013, on the basis of returns from 38 states and the District of Columbia. The increase over March, 32 per cent, was of about normal seasonal proportions, so the industry held its own in April. Compared with April, 1930, however, this estimate indicates a loss of about 26 per cent.

Ford apparently resumed sales leadership in the passenger car field in April. The estimate places his registrations for April at 80,520, as compared with 79,763 for Chevrolet. Buick was third and Pontiac fourth.

Graham Shipments Gain 53 Per Cent

DETROIT, May 28—Factory shipments of the Graham-Paige Motors Corp. are currently at a rate 53 per cent in excess of April shipments. The Detroit plants are working on a schedule of five days a week, and the daily schedule at the body plants has been increased from six to nine hours. June schedules will be at the same rate as May.

Test New Wind Tunnel

WASHINGTON, May 28—A new wind tunnel designed for testing full-sized planes instead of scale models of same, and a fully inclosed channel for testing the pontoons of seaplanes, were inaugurated at the annual meeting of the National Advisory Committee for Aeronautics, which opened at Langley Field, Va., on May 27. The building which houses the wind tunnel measures 224 by 434 ft. and is 100 ft. in height. The mouth of the tunnel is 30 by 60 ft. and an air blast of up to 115 m.p.h. can be sent into it.

Tire Makers Define Terms

Clarify Them For Use in Advertising; Leading Producers Agree

NEW YORK, May 27—Many leading tire manufacturers and distributors have voluntarily agreed upon a set of definitions calculated to govern their advertising and selling practices.

These definitions have been approved for general use in compliance with a resolution adopted at a trade conference, held last September at Akron, Ohio, and in line with further suggestions made at a second conference at Akron last March.

The resolution stipulated as general principles that "tire advertising shall not be deceptive or misleading to the consumer or disparaging to competition," and that "tire manufacturers and distributors will submit proof of claims made in advertising upon request of the National Better Business Bureau."

Hercules Offers Units

CANTON, May 27 — For oil field service the Hercules Motors Corp. has developed an additional line of power units built around the heavy-duty "HX" series of six-cylinder engines. The "HX" power units are built in five different sizes: the HXA, 4¾ x 6 in., displacement 638 cu. in.; the HXB, 5 x 6 in., displacement 707 cu. in.; the HXC, 5¼ x 6 in., displacement 779 cu. in.; the HXD, 5½ x 6 in., displacement 855 cu. in., and the HXE, 5¾ x 6 in., displacement 935 cu. in.

All "HX" power units in the standard assembly include a radiator, a clutch power take-off and engine accessories. A control box located on the opposite end from the radiator provides for regulation of carburetor and magneto.

Dodge Adds 122 Dealers

DETROIT, May 27—With the addition of 122 new dealers to its distributing organization since the first of the year, Dodge Brothers has provided owners with facilities for complete service at approximately 5000 stations in the United States.

According to A. vanDerZee, general sales manager for Dodge, almost one-third of the new dealers are located in the New York region.

Harvester States Plan

CHICAGO, May 25—In connection with a proposed increase in the authorized capital of the International Harvester Company export subsidiary to $15,000,000 from $2,000,000, the parent company has issued the following statement: "Authority to increase the capitalization of the International Harvester Export Corporation is being obtained for the purpose of reshaping its capital structure. No new investment is involved at this time, but only a conversion of a larger portion of existing investment into capital shares as distinguished from loans."

S.A.E. Executives Meet

CHICAGO, May 26—The executive committee of the council of the Society of Automotive Engineers met Saturday morning at the Bendix Gallery, 1350 Lake Shore drive. Vincent Bendix, president of the society, presided. Following the meeting Mr. Bendix entertained the members at luncheon and immediately afterward the party left on a special train for South Bend to inspect plants of the Bendix Aviation Corporation.

Budd Wheel Declares; Acquires Holley Business

PHILADELPHIA, May 25 — At a meeting of the directors of the Budd Wheel Co., the regular quarterly dividend of $1.75 per share, with an extra dividend of 75 cents per share, was declared on the 7 per cent preferred stock of the company.

The regular quarterly dividend of 25 cents per share on the common stock was also declared. Both dividends are payable June 30 to stockholders of record June 10.

It was also announced that the company had just acquired the brake drum business of the Holley Permanent Mold Machine, Inc.

Nuvolari Wins Classic

PARIS, May 16 *(by mail)*—Tazi Nuvolari, driving a new type straight eight Alfa Romeo, won the twenty-second Targa Florio race, in the island of Sicily, covering 363 miles in 9 hours 27 seconds, the average being just over 40 miles an hour. Borzacchini was second on a six-cylinder Alfa Romeo, and Varzi on a Bugatti third. Campari, Dippolito and Arcangeli, all on Alfa Romeos, held the three following positions.

Bendix Adds Space

CHICAGO, May 26—The Bendix Aviation Corp. has added more than 500,000 square feet of manufacturing space at the South Bend, Ind., plant during the year. Most of the additional space is being used by the Bendix Stromberg Carburetor Co.

Babcock Acquires License

NEW YORK, May 27—The Babcock and Wilcox Co. has acquired non-exclusive license under the patents of the Automatic Arc Welding Co.

Steady June Seen for Steel

Youngstown Mills Move to Combat Proposed Freight Rate Increases

NEW YORK, May 28—Automotive business in sight suffices to insure a virtually unchanged rate of operations for steel finishing mills during the first half of June. While primary mills generally are lagging behind finishing mills, some districts, as for instance Buffalo, make a much better showing than is the case in other localities. Buffalo reports place the rate of operations at nearly 55 per cent of capacity.

A three or four days' shutdown by way of lengthening Saturday's holiday will probably be the rule at most plants. Sheet mills are prepared for a moderate tapering off in specifications during the second half of June. So far, at least, the steel market has in no wise reflected any change as the result of the utterances of the industry's leaders regarding the price situation. No one looks for a marked change in the market's tone until broadening of the demand furnishes the necessary support.

The leading "independent" specialist in full-finished automobile sheets is concentrating production in the Detroit area, and the market for full-finished sheets is being made more and more in Detroit, with mills less favorably situated geographically having to follow suit and meeting competition generally.

The market is now quotable at 3 @ 3.10 cents, Pittsburgh. Efforts on the part of strip steel mills to put third quarter prices on a slightly higher basis continue; on the whole, however, very little change in the market's price structure during the third quarter is looked for. Youngstown district mills are taking measures to combat proposed freight rate increases before the Interstate Commerce Commission.

Pig Iron—The market is dull, but routine business from automotive foundries continues to come through. The Michigan price for foundry and malleable is $17 to $17.50, and the former price level applies also to the valley market.

Aluminum—During the first four months of this year exports from Canada totaled 4,424,400 lb., as compared with 15,624,200 lb. during the corresponding period of 1930. Remelted metal is in abundant supply and automotive foundries are buying only as they need supplies. The virgin metal market is unchanged.

Copper—All sorts of wild rumors have been making the rounds, among these one that the leading international banking house would supply the funds so that copper accumulations could be held pending moderate recovery of the market. There was very little buying at the 8¾ cents, delivered Connecticut point, at which the market opened on Monday.

Tin—The market is quiet, the opening price for spot Straits this week having been 23⅛ cents. For distant maturities traders on the National Metal Exchange are bidding 1@2 cents over spot quotations.

Lead—The market's undertone is firmer.

Zinc—Dull and steady.

White Co. Enters Canada

New Factory Will Build All Models In Standard Line

CLEVELAND, May 27—Establishment of a plant at Montreal, Que., for the building of White trucks and buses was announced today by A. G. Bean, president of the White Motor Co. Starting June 1 the Montreal plant will be in production to supply the entire Dominion of Canada.

L. M. Hart, vice-president of the White Company, Ltd., will direct activities of the new plant and the company will continue factory branches at Montreal, Toronto, Winnipeg, Calgary, and Vancouver, with dealers in all principal Canadian cities.

"We are establishing a Canadian factory to keep pace with the rapid growth of Canadian industry," Mr. Bean said in his announcement.

"For the past 22 years we have been represented in Canada by the White Company, Ltd.

"By building White trucks and buses in Canada we will have facilities to meet the growing demand for White products and to give to operators of trucks and buses in that country an unexcelled transportation service."

The White Company's complete line of standard truck and bus chassis, as well as bodies and extra equipment, will be built in Canada.

Cites Car Safety

LINCOLN, NEB., May 25—Accident insurance companies in Nebraska henceforth will not be permitted to make payments of automobile accident benefits contingent upon the machine involved being wrecked or disabled, according to the ruling of Insurance Commissioner Kizer. Approval of this form has been withdrawn as of May 18. He said: "Owing to the fact that modern construction of automobiles is such that the car will stand unbelievable punishment without disablement and that persons may be seriously injured or even killed without disablement of the automobile, we are of the opinion that no accident policies providing for loss while riding in an automobile or other vehicle should be limited to injury caused by wreckage or disablement of the automobile or conveyance."

Credit Men to Meet

NEW YORK, May 27—A credit meeting of representatives of the automotive, tire and rubber industries, numbering about 40 credit executives, will be one of 22 credit group conferences which will feature the Credit Congress of Industry of the 36th annual convention of the National Association of Credit Men at Boston, Mass., June 22-27, it has been announced by Elliot Balestier, Jr., credit group director of the association.

The automotive, tire and rubber session, under the chairmanship of Martin A. Campbell, credit manager of the American Motor Equipment Co., Boston, will meet along with the other groups on Friday and Saturday, June 26 and 27. The Credit Congress of Industry, of which this group is a part, has grown out of the credit group sessions which have been held at each convention since they were introduced in 1924.

Altoona Track Leased

PHILADELPHIA, May 27—Ralph A. Hankinson, president of Hankinson Speedways, Inc., has leased the Altoona, Pa., board race track from the Altoona Speedway Corp.. The first race under the new management will be held July 4, instead of on Flag Day, and the usual Labor Day event will follow at the end of the season. Both races will be under AAA sanction, and will be championship events. Harry Riggins, former race driver, has been named Mr. Hankinson's representative at the Altoona track, succeeding Paul C. Pommer, who managed the track for the Altoona Speedway Corp.

Continental Aero Schedules

DETROIT, May 27—Continental Aircraft Engine Co. is maintaining a production of one engine per day throughout May on the Model A70 165 hp. engine. From present indications, the output will be increased to two engines per day during June.

On the light Model A40 June production will be at least one engine per day. An order for 25 of these engines for scheduled delivery has been received from Taylor Aircraft Company, Bradford, Pa.

Millard Fred Rigby

SOUTH BEND, IND., May 26—Millard Fred Rigby, advertising manager, Studebaker Corp., died Saturday after a long illness. He was with the Studebaker Corporation six years. Mr. Rigby formerly was associated with the Capper publications and the *Chicago Tribune*. His father, W. O. Rigby, is mayor of Topeka, Kan., where Mr. Rigby was born. He is survived by his widow, Mrs. Mary Poindexter Rigby, and two young sons, Robert and Richard.

Ewertz Gets Award

Eric Harold Ewertz has received the 1930 Award of the Samuel Wylie Miller Memorial Medal for "pioneering in the development and application of arc welding." Mr. Ewertz is a past president of the American Welding Society.

April Output Shows Gain

Census Figures Place It at 335,708 Units for U. S.; Up 59,303

WASHINGTON, May 28—Making a gain of 59,303 units, the April production of motor vehicles in the United States was 335,708, compared with 276,405 in March, according to reports received by the Department of Commerce. The output of passenger cars rose 54,194 units to a total of 285,028, while the gain in trucks was 4854 with a total of 50,015. The output of taxicabs increased to 665 from 410.

The Canadian production of motor vehicles in April was 17,159, against 12,993 in March. The passenger output increased to 14,043 from 10,483, while the truck production rose to 3116 from 2510.

Aircraft Exports Valued

WASHINGTON, May 27—During the month of March United States builders of aircraft and aircraft engines exported nine aircraft, valued at $49,770, and 46 engines for aircraft, valued at $235,481, according to the Department of Commerce. Exports of aircraft parts and accessories, except tires, were valued at $200,859 for the month. Shipments to Hawaii and Porto Rico are not included in the above figures.

Placky Wins at Waukegan

CHICAGO, May 25—Art Placky, Chicago, drove the ten-mile feature event in 11 min., 31 sec., to climax the opening race program at Waukegan speedways half-mile dirt track recently. Carl Young and Harry Nichols finished second and third. Three five-mile events were won by Carl Young, Art Placky and Mike Moscon respectively.

Auburn Betters 1929 Record

DETROIT, May 25—Auburn Motor Car Co.'s production up to May 25 this year exceeded its production for the entire year of 1929, the company's previous biggest year. The output from Jan. 1 to May 25 this year has totaled 22,759, as against 22,749 for the entire year of 1929. Auburn's 1930 output was 13,693.

Fabric Makers to Meet

NEW YORK, May 27—Detailed plans are now in progress for the program of the coming convention of the Associated Manufacturers of Fabric Auto Equipment, Inc., to be held Friday and Saturday, June 12 and 13, 1931, at the French Lick Springs Hotel, French Lick, Indiana.

Men of the Industry and What They Are Doing

Cincinnati A.S.M.E. Elects

R. E. W. Harrison, chief engineer, Cincinnati Grinders, Inc., has been re-elected chairman of the Cincinnati Section, American Society of Mechanical Engineers. H. C. Uihlein, Cincinnati Engineering Tool Co.; William F. Groene, R. K. LeBlond Machine Tool Co.; George Seyler, Lunkenheimer Co.; George Langan, Cincinnati Planer Co.; C. L. Koehler, Alvey-Ferguson Co.; William H. Vockell, Cincinnati Engineering Tool Co.; and Harry Feldbush, Worthington Pump & Machinery Corp., have been elected to the executive committee of the Section.

Proctor Heads Parkin

R. W. Proctor, for 12 years sales manager of Black & Decker Mfg. Co. and later sales manager of the Van Dorn Electric Tool Co., is now identified with Parkin, Inc., as president. This firm is manufacturing and distributing the Parkin Spark Plug.

Other officers of Parkin, Inc., are J. H. Smith, vice-president; F. H. Zulauf, treasurer, and George Parkin, chief engineer.

Fowler Goes to Europe

Volney B. Fowler, publicity manager of General Motors Export Co., sailed last week aboard the S.S. Hamburg, for a trip to Europe. Mr. Fowler will spend most of his time while abroad in France, but will visit other General Motor offices in England and on the Continent. He was accompanied by his family and expects to be gone about six months.

Bryant Grinder Elects

W. J. Bryant, E. J. Fullam, and J. B. Johnson have been added to the directorate of the Bryant Chucking Grinder Co., Springfield, Vt. Mr. Fullam has been elected president of the company; Mr. Bryant, vice-president; Mr. Stetson, general manager; Mr. Johnson, assistant general manager, and A. L. Hicks, assistant treasurer.

Ritzie Succeeds Laning

R. M. Laning resigned as works manager of the Monroe plant of the Newton Steel Co. R. L. Ritzie, manager, Newton Falls plant, will manage both plants.

N.E. Section Elects

Robert F. Lybeck, sales manager of the Colonial Beacon Oil Company, Boston, was elected chairman of the New England Section, S.A.E., at the May meting.

Dean Fales, of Cambridge, on the faculty of Massachusetts Institute of Technology, was chosen vice-chairman. Fred W. Herlihy, sales manager of the Boston Division, Shell Eastern Petroleum Products Co., was elected secretary. A. E. Postal, the new treasurer, is service manager of the Boston branch of United Motors Service.

Weedon Succeeds Fisher

Russell Manufacturing Co., Middletown, Conn., has appointed Daniel R. Weedon as treasurer and general manager, succeeding William G. Fisher, who retires on June 1 after 50 years of service. Mr. Fisher became treasurer and general manager of the company in 1919, and expects to maintain a close connection with the company now, but will devote most of his time to his hobbies.

Black Names Steinhauer

R. F. Black, succeeding Martin A. O'Mara as president of Brockaway-Indiana Truck Corp., announces the appointment of F. P. Steinhauer as vice-president in charge of national account sales of the Indiana division of the corporation. Mr. Steinhauer was formerly in charge of Chicago territory, where he is succeeded by Joseph Cook of Louisville.

C. W. Jacobs on Tour

C. W. Jacobs, service manager for the Buick Motor Company, is now on a tour of service inspection that will cover many sections of the country. During his trip Mr. Jacobs will contact regional and zone managers, as well as regional and zone service managers.

Bendix Promotes Kliesrath

Victor Kliesrath has been placed in entire charge of all engineering for the automotive division of the Bendix Aviation Corp.

Motor Leaders File Opposition

Only Trucks Cited in General Review of Coordination Proposal

NEW YORK, May 29—Opposition to any proposition for the regulation of interstate truck operation was to be advanced today by the National Automobile Chamber of Commerce in a memorandum filed with the Interstate Commerce Commission on behalf of the motor industry by LaRue Brown and Stuart N. Scott, Chamber counsel.

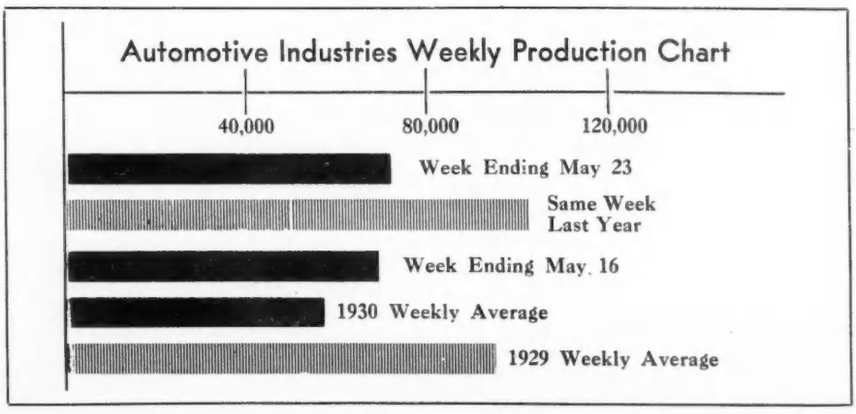
Reviewing the testimony submitted during the Commission's recent investigation of rail-motor coordination, Mr. Brown declared that there was no evidence to justify the imposition of more rigid governmental control over common-carrier truck operation. While not opposing the regulation of interstate buses, the Chamber expressed itself as not sharing the optimism in its success of the interests supporting it.

The manufacturers' opposition to the proposal for truck regulation was based on the arguments that such regulation was not in the interest of or desired by shippers or the general public; that governmental interference with private business should not be extended; that such regulation would be unconstitutional—or if constitutional would be impractical; and that instead of relieving railroads of competitive difficulties, regulation would actually react to the injury of the rail carriers.

The point was made that the only demand for regulation of highway carriers had emanated almost entirely from groups which might expect to benefit by decreasing the efficiency of motor truck service.

Mechanics Order Renewed

CHICAGO, May 28—Renewal of a large blanket contract for universal joints, by one of the leading automobile manufacturers, has just been made with the Mechanics Universal Joint Company, Rockford, Ill., a division of Borg-Warner Corporation, and brings the company's unfilled orders to the highest point in several weeks.



Exports, Imports and Reimports of the Automotive Industry For April and Four Months Ended April, 1931-30

	Month of April				Four Months Ended April			
	1931		1930		1931		1930	
	Number	Value	Number	Value	Number	Value	Number	Value
Automobiles, parts and accessories	.....	$18,004,132	.....	$35,111,115	.....	$66,924,289	.....	$132,562,613
*Electric truck and passenger cars	.....	.....	5	6,987	.....	.....	22	33,901
Motor trucks and buses except electric (total)	5,499	2,739,610	11,461	7,637,056	20,330	10,720,371	40,048	26,242,327
**Under 1 ton	490	172,575	2,963	1,888,199	3,908	1,423,623	18,048	9,519,571
**1 and up to 1½ tons	4,474	1,905,817	7,764	4 430,931	13,517	6,179,771	20,098	12,998,355
**Over 1½ tons to 2½ tons	362	408,859	734	1,317,926	2,162	1,931,482	1,902	3,724,401
**Over 2½ tons	144	229,680	.....	.....	585	1,098,062	.....	.....
PASSENGER CARS								
Passenger cars except electric	11,228	6,862,998	23,777	15,402,560	40,530	24,415,131	79,931	55,165,614
Low price range, $850, inclusive	8,879	4,238,209	18,376	8,953,827	32,150	15,082,761	58,146	29,301,851
**Medium price range, over $850 to $1,200	1,531	1,441,387	4.705	4,784,552	5,381	5,077,813	19,264	19,943,785
**$1,200 to $2,000	379	549,585	696	1,664,181	1,357	1,977,959	2,521	5,919,978
**Over $2,000	197	527,839	.....	.....	755	1,898,445	.....	.....
PARTS, ETC.								
Parts, except engines and tires	.....	.....	.....	.....	.....	.....	.....	.....
Automobile unit assemblies	.....	5,116,448	.....	6,120,882	.....	19,126,926	.....	27,744,123
Automobile parts for replacement (n.e.s.)	.....	2,454,200	.....	4,423,499	.....	10,062,875	.....	17,095,943
Automobile accessories	.....	430,742	.....	597,590	.....	1,417,470	.....	2,358,026
Automobile service appliances (n.e.s.)	.....	115,262	.....	597,400	.....	555,344	.....	2,498,593
Trailers	141	43,214	376	51,627	428	114,102	610	239,741
Airplanes, seaplanes and other aircraft	8	99,448	18	288,603	36	420,839	74	1,174,305
Parts of airplanes, except engines and tires	.....	156,180	.....	134,234	.....	717,091	.....	660,908
BICYCLES, ETC.								
Bicycles	99	2,686	304	8,453	620	16,547	1,080	30,935
Motorcycles	1,002	240,416	1,737	419,023	3,057	742,178	6,305	1,433,633
Parts and accessories, except tires	.....	49,032	.....	111,282	.....	213,125	.....	439,045
INTERNAL COMBUSTION ENGINES								
Stationary and Portable								
Diesel and Semi-Diesel	22	24,442	10	32,504	139	135,029	110	281,055
Other Stationary and Portable								
Not over 10 hp.	957	74,510	2,043	177,033	3,508	278,382	9,669	781,683
Over 10 hp.	274	137,606	650	432,061	1,236	688,721	1,894	1,099,853
Automobile engines for:								
Motor trucks and buses	813	128,365	3,341	272,456	2,885	420,158	17,257	1,374,408
Passenger cars	2,929	271,769	5,394	552,436	8,765	761,338	24,339	2,233,031
Tractors	3	1,395	23	6,869	5	2,402	106	47,686
Aircraft	19	57,176	29	109,324	95	479,460	86	364,985
Accessories and parts (carburetors)	.....	278,301	.....	346,673	.....	870,215	.....	1,371,592
IMPORTS								
Automobile and chassis (dutiable)	51	120,014	38	69,431	174	232,779	158	272,969
Other vehicles and parts for them (dutiable)	.....	7,933	.....	26,644	.....	20,583	.....	80,405
REIMPORTS								
Automobiles (free from duty)	18	7,260	36	22,598	65	64,485	93	80,312

* Not shown separately after 1930.
** Classification changed beginning January, 1931.

N.A.C.C. Plans Meeting

NEW YORK, May 28—Problems confronting automobile manufacturers will be discussed by leaders of the industry at the annual meeting of the National Automobile Chamber of Commerce to be held at the organization's headquarters in New York, June 5.

Topics which have been listed for discussion include: "The General Business Outlook," "Advantages and Disadvantages of Territorial Protection and Time Contracts," "Rail Opposition to Highway Transportation," "Highway Safety Junking Plan," "New Freight Rate Schedules and Their Effect on the Industry," "Export Problems and Outlook for Trade Overseas."

Foreign Traders Meet

NEW YORK, May 29—Exporters from various industries throughout the country today closed a three-day meeting, under the auspices of the National Foreign Trade Council. This is the 18th Annual National Foreign Trade Conference, but it is the first to be held in New York City.

Conditions of the various foreign markets were discussed at this meeting, and the elements of foreign banking and financing were entered into very thoroughly.

In addition to the exporters themselves, the speakers included representatives of some of the foreign countries which furnish a large market for American manufactured products.

Today's luncheon session of the meeting was held under the auspices of the Overseas Automotive Club, under the chairmanship of P. F. Baillet, president of that club. At this session, reports were on the overseas market for automotive replacement parts and shop equipment. The next conference will be held in Honolulu.

Petroleum Imports Drop

NEW YORK, May 27 — Imports of petroleum for the week ended May 23 are estimated at 190,143 bbl. daily, as compared with the daily average of 193,857 bbl. for the preceding week, and a daily average of 208,929 bbl. for the four weeks ended May 23, according to the American Petroleum Institute.

Crude runs to stills for the week are estimated at 2,441,700 bbl. daily.

Reports from 94.9 per cent of the estimated potential charging capacity indicate that 3,335,000 bbl. of cracked gasoline were produced.

M.E.A. Credit Activity Begins Its 23rd Year

NEW YORK, May 28—The Credit Department of the Motor and Equipment Association has just started out on its twenty-third year, a record for continuous membership cooperation which is surpassed by only one other activity sponsored by the association.

Acutis is Honored

NEW YORK, May 27—A Bureau Permanent International des Constructeurs d'Automobiles, as powerful a factor in the international automobile industry, and as effective a meeting ground for the solution of common problems and differences as is the National Automobile Chamber of Commerce in the American industry was visioned today by Sig. Giuseppe Acutis, president of the international body, at a luncheon tendered him by the N.A.C.C. at the Transportation Club, New York. He expressed himself as much impressed with the work the national body has done in bringing members of the industry together and giving them a common understanding, and pointed to it as a vital factor in helping the American industry to achieve the position it now holds.

He hopes that the international group can become equally effective in bringing the industry of the world together on a similar basis of common understanding and working together, instead of the present condition of individual jealousy and fear that seems to exist among many of the European manufacturers.

Russell Managers Meet

NEW YORK, May 29—Russell Mfg. Co. is holding a three-day divisional managers' meeting at Middletown, Conn.

Political Unrest Affects Automotive Sales in Spain; Two Other Markets Described

PHILADELPHIA, May 25—Automotive market conditions in Spain, Sweden, and Yugoslavia are described in the reports appearing below, which have been condensed from official sources reporting to the Automotive Division, Bureau of Foreign and Domestic Commerce, Washington. The three reports follow those on ten other countries, which appeared in last week's issue of *Automotive Industries*. More detailed information on any of the countries may be obtained on application to the Automotive Division, by interested firms listed in the "Exporter's Index."

Spain

Automotive sales were retarded by the political unrest and slowing up of industry. All classes of cars were affected, though medium-priced lines appeared to have suffered more severely than the others. The position of dealers handling American cars was very precarious, and it was reported that only those companies which had their own sales organizations in the country were sure to survive. The situation of dealers handling European lines was even more difficult than that of those handling American makes, because European machines have been losing ground to American cars for more than a year. The dealer organizations of Citroen, Fiat and Renault, the principal European competitors in Spain, have been weakened greatly in recent months.

Despite the fact that imports have been greatly curtailed, stocks of cars on hand were normal under existing conditions. Stocks of American low and medium price cars were adequate, particularly the latter class, since some firms had not yet disposed of all cars brought in before the increase in duties in July, 1930. Stocks of high-priced American cars were small, as were those of all European cars.

Used cars moved very slowly, especially the high-powered ones, since sales are retarded because of the internal taxes. The high prices demanded and received just after the increase in duties last July no longer prevailed. Stocks in dealers' hands were not large because they followed a cautious policy in handling trade-ins. A frequent practice was not to accept the old car or make an allowance for it until arrangements had been made to dispose of the used car.

Approximately 80 per cent of all trucks sold were of the light class, 1 to 1½ tons capacity or less, and the trend toward light commercial vehicles became more pronounced since the suspension by the government of many construction projects for which heavy trucks were used.

Sweden

There was a decided decrease in the sale of passenger cars during the first quarter of 1931 as compared with the corresponding quarter of 1930. Some of the distributors estimated this drop as high as 20 per cent. The outstanding reason for this sharp downward swing of sales was the slowing up of industry and trade, together with the severe winter weather with heavy snows and much cold weather. During the first two months of 1931 a total of 67 imported European cars were sold in Sweden. Velvo, the Swedish car, was reported to have sold no less than 59 passenger cars during these two months, a considerable increase over similar sales in 1930.

Practically the entire demand for heavy trucks and buses is supplied by two domestic makes, and orders on hand are expected to keep these firms going for several months. The sale of imported trucks declined during the quarter in sympathy with the general decline in automotive sales.

Sales of some of the imported motorcycles during the first quarter of 1931 did not exceed 25 per cent of the total for the corresponding period of 1930. Many dealers have unusually large stocks of used units on hand and this had a detrimental effect on the market for new machines. Distributors were not optimistic about sales prospects for 1931 and it was believed that the imported makes will suffer the greatest part of the decline in sales.

Yugoslavia

Yugoslavia must be considered primarily as a consumer of low-priced lines of motor vehicles, and from that point of view stocks were slightly higher at the end of the first quarter of 1931 than at the corresponding time in 1930. This year the usual spring increase in sales had not manifested itself by the end of March, due to the combination of unfavorable business conditions and bad weather.

The used car problem is unusual in that stocks are very high despite the relatively small amount of new car sales. This condition is said to be due to the fact that many prospective first car buyers have been prevented from entering the market, and such sales as are made involve a trade-in.

The bus business, closely interwoven with that of trucks, was relatively good during the quarter and offered possibilities primarily because of the lack of railways in many sections. Considerable competition was offered.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, May 27—There was a moderate improvement in retail trade last week, especially in seasonal goods; but wholesale and jobbing lines for the most part were quiet. Collections continued slow. An improvement in building in some sections was reported.

EMPLOYMENT

Employment in 15 industrial groups during April, according to the Department of Labor, increased 0.2 per cent, while payroll totals decreased 1.5 per cent. Employment and payroll totals in these groups decreased in April below those in March in seven of the nine years in which these indices have been compiled.

INDUSTRIAL ACTIVITY

Industrial activity during April, based on the consumption of electrical energy, was 2 per cent below that during the preceding month and 12 per cent below that a year ago.

CAR LOADINGS

Railway freight loadings during the week ended May 9 totaled 747,449 cars, which marks a decrease of 27,842 cars below those during the preceding week, a decrease of 184,897 cars below those a year ago, and a decrease of 301,511 cars below those two years ago.

COTTON SPINNING

There were 33,057,118 cotton spinning spindles in place at the end of April, of which 26,645,404 were in operation at some time during the month, as against 26,489,832 during the preceding month and 28,851,122 a year ago.

CRUDE OIL OUTPUT

Average daily crude oil production during the week ended May 18 amounted to 2,426,800 bbl., as against 2,468,700 bbl. for the preceding week and 2,607,900 bbl. a year ago.

BANK DEBITS

Bank debits to individual accounts outside of New York City during the week ended May 20 were 18 per cent below those a year ago.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended May 23 stood at 71.0, as against 71.8 the week before and 72.0 two weeks before.

STOCK MARKET

The stock market last week again receded. Declines were general, with 373 stocks making new lows for the year, while some issues reached the lowest level in several years. Despite rallies, mostly in the latter part of the week, the majority of stocks showed net losses for the week.

BROKERS' LOANS

Brokers' loans in New York City during the week ended May 20 decreased $40,000,000, which combined with the $178,000,000 decrease in the four weeks preceding makes a total reduction of $218,00,000 during the five weeks ended May 20.

RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended May 20 showed an increase of $4,000,000 in holdings of discounted bills and a decrease of $22,000,000 in holdings of bills bought in the open market. Holdings of Government securities remained practically unchanged. The reserve ratio on May 20 was 84.9 per cent, as against 84.5 per cent a week earlier and 83.4 per cent two weeks earlier.

World Vehicle Output Set

Automotive Division Completes Compilation of Final Figures

WASHINGTON, May 27—The Department of Commerce Automotive Division figure for world motor vehicle production for 1930, just announced, was 4,109,231 units. The total published February 28 in the Statistical Issue of *Automotive Industries* was less than ½ of 1 per cent under this, because of slight errors due to the necessity for estimating some of the production from incomplete returns earlier in the year.

The 1930 world production showed a decrease of 34.6 per cent as compared with the 1929 figure. There was an increase of 20.6 per cent between the 1930 and 1929 and 1928 production totals.

World production as reported to the government is shown at right.

World Production of Motor Vehicles

Producing Country	1929 Passenger Cars	1929 Trucks and Buses	1929 Total	1930 Passenger Cars	1930 Trucks and Buses	1930 Total
United States	4,587,400	771,020	5,358,420	2,784,745	571,241	3,355,986
Canada	207,498	55,797	263,295	125,442	28,750	154,192
Total	4,794,898	826,817	5,621,715	2,910,187	599,991	3,510,178
All other:						
Austria	5,960	3,150	9,110	1,100	2,100	3,200
Belgium	6,000	1,000	7,000	3,800	900	4,700
Czechoslovakia	12,210	2,530	14,740	13,110	3,730	16,840
Denmark	.....	150	150	.....	230	230
England	177,769	56,156	233,925	169,099	66,577	235,676
France	198,000	50,000	248,000	181,250	40,700	221,950
Germany	56,500	24,000	80,500	59,689	10,355	70,044
Hungary	381	251	632	198	643	841
Italy	44,000	10,100	54,100	27,997	8,535	36,532
Japan	.....	215	215	.....	265	265
Poland	.....	450	450	200	300	500
Russia	152	1,554	1,706	[1]4,425	.....	4,425
Spain	190	260	450	130	320	450
Sweden	500	1,258	1,758	600	1,800	2,400
Switzerland	150	2,850	3,000	100	900	1,000
Total	501,812	153,924	655,736	461,698	137,355	599,053
Grand total	5,296,710	980,741	6,277,451	3,371,885	737,346	4,109,231

[1] All types for year ended Sept. 30, 1930.

Curtiss-Wright Reports

NEW YORK, May 26—Curtiss-Wright Corp. reports net loss for the first quarter of the current year of $1,488,-124. This compares with a loss of $1,620,921 for the corresponding period of 1930.

In the report, the company points out that operations during the first quarter were handicapped as the result of a strike in the plant of the Wright Aeronautical Corp. in Paterson, which occurred in December and delayed deliveries. Further delay was occasioned by the plant consolidation activities, which it is now hoped, will soon begin to show full effect in operating results.

The company believes that the combined results for the month of April will show considerable improvement over those for the first three months.

Siamese Market Growing

WASHINGTON, May 26—A gradual increase in sales of American cars and trucks in Siam is to be expected in the future and the extent and rapidity of that increase will depend largely upon highway development, according to Commercial Attache Frank S. Williams, who is in Washington on furlough from his assignment in Bangkok.

Hutto Reorganizes

DETROIT, May 25—In connection with the reorganization of Hutto Engineering Co., Inc., the following personnel changes have been announced:

Joseph A. Carlin, formerly receiver, has been appointed general manager. Frank J. Jeschke has been appointed sales engineer. Ben O. Isom has returned to Hutto as factory representative for Detroit and Chicago territories; William F. Toepfer has been appointed factory representative for Philadelphia, New York and Boston territories; J. L. Navin has been appointed field engineer for Cleveland, Ohio; Pittsburgh, Pa.; Buffalo, Rochester and Syracuse, N. Y., territories.

James G. Young is assuming responsibility for sales until June when he will leave for an extensive tour of Europe and the Antipodes. He will locate in Europe as Hutto Engineering Co.'s overseas representative.

G.M.A.C. Completes Home Conferences

NEW YORK, May 25—General Motors Acceptance Corporation has just completed a series of four regional conferences at which company executives met with field representatives. These meetings, which were held in Hot Springs, Ark., Los Angeles, Calif., French Lick Springs, Ind., and New York, took the place of the usual yearly conference formerly held in New York.

Fairchild Buys Company

NEW YORK, May 26 — Fairchild Aviation Corp. has purchased the entire capital stock of Aerotopograph Corp. at Washington, and is combining the air mapping company with its own subsidiary, Fairchild Aerial Survey Corp.

French Urge Aero Decentralization

WASHINGTON, May 25—Holding that decentralization of the aviation industry is a desirable national safety measure, French industrialists are advocating a plan for removing certain factories from Paris and locating them in various parts of the country, according to a report received in the Commerce Department from trade commissioner W. L. Finger, at Paris.

Viking Pump Declares

CHICAGO, May 25—W. N. Hostrop has resigned as a director of Viking Pump Company, and is being replaced by H. P. Hansen. Charles W. Olsen has been made treasurer, according to official anouncement. Directors of the company declared the regular quarterly dividend of 60 cents a share on the preferred stock. The company reports earnings are holding satisfactory levels.

Plans Wide Program

CLEVELAND, May 25 — Sixty-five technical papers are on the tentative program of the annual convention of the American Society for Steel Treating, which will be a feature of the National Metal Congress and Exposition in Boston, Sept. 21-25. This is a more than 50 per cent increase over the number presented at the Metal Congress, held last fall, in Chicago.

Hercules Motor Co. has declared a quarterly dividend of 20 cents on common stock, payable July 1 to stockholders on record June 20. The company was formerly paying 30 cents a share.

Plane Output Trend Upward

First Quarter's Report Shows Increase of 87 Units Over Preceding Period

WASHINGTON, May 27—Airplanes manufactured in the United States during the first three months of 1931 totaled 672, an increase of 87 over the number produced in the last three months of 1930, according to a report prepared by the Aeronautics Branch of the Department of Commerce and made public today. The number of craft built for domestic civil use during the first quarter of 1931 was 342, which was an increase of 89 over the number manufactured for that purpose in the final three months of 1930.

The 342 airplanes built for civil use in this country included 236 monoplanes, 95 biplanes, 9 autogiros, 1 helicopter and 1 sesquiplane. Of the monoplanes the majority were landplanes of the one or two-place open cockpit types, and of the biplanes, the majority were either two or three-place open cockpit landplanes.

Of the airplanes produced from January 1 to March 31, 1931, the total of 672 was divided as follows: 342 for civil use, 302 for military deliveries and 28 for export to foreign countries. This may be compared with 585 airplanes manufactured in the last three months of 1930, of which 253 were for civil use, 280 for military deliveries and 52 for export.

Records of the Aeronautics Branch show that the 342 airplanes manufactured for domestic civil use were built by 103 companies or individuals. Thirty manufacturers built 208 airplanes under 50 approved type certificates. Ten planes were approved for license in accordance with the provisions of Group 2.

Air Demonstration Ends

PHILADELPHIA, May 28—With a demonstration over Philadelphia tomorrow, and a demonstration over Washington on May 30, the First Provisional Air Division of the Army Air Corps, comprising 672 airplanes, will bring to a conclusion maneuvers lasting more than a week. The demonstration began for the East May 23, when the division participated in the dedication of the new Floyd Bennett Memorial Airport in New York City, and officially ends when the division disbands into its component units June 1, after a day of coordinated ground maintenance. In command of the First Provisional Air Division during the maneuvers was Brigadier General Benjamin D. Foulois.

Perfect Circle Sets Record

CHICAGO, May 26—April replacement sales through automotive equipment jobbers by the Perfect Circle Co., Hagerstown, Ind., established a new all time record with an increase of 42 per cent over April 1930, and 61 per cent over the same month of 1929, Lothair Teetor, vice-president, announces.

Michigan Offers Course

ANN ARBOR, MICH., May 26—A four-year undergraduate curriculum in transportation engineering, leading to the degree of B.S. in Eng. (transportation), is being offered by the Engineering College of the University of Michigan, according to an announcement from John S. Worley, professor of transportation engineering.

The program outlines considerable work to be done by the student in the fields of motor vehicle transportation and aviation, besides offering a good general background in cultural subjects and economics of transportation. Facilities of the College of Engineering permit graduate work in specialized problems of automotive and aeronautic engineering.

Army Air Corps Using Many Types of Planes In Division Test

NEW YORK, May 25—The 672 planes participating last week and this in the maneuvers of the First Provisional Air Division are divided into the following types and makes:

Pursuits	
135	Boeing P-12
75	Curtiss Hawk Bombardment
10	Curtiss Condors
34	Keystone Bombers
Light Bombardment	
36	Douglas BT
Attack	
70	Curtiss A-3
Observation	
142	Douglas Observation
63	Curtiss Falcons
60	Thomas-Morse Observation
Transport Group	
23	Fokker Transports
11	Ford Transports
5	Douglas Transports
4	Sikorsky Transports
2	Northrup Transports
Photographic	
2	Fairchild
672	

Engines used to power the 672 planes in the First Provisional Air Division, are divided into types and makes, as follows:

Pratt & Whitney Wasp	289
Pratt & Whitney Hornet	119
Curtiss Conqueror and D-12	214
Wright Whirlwind J-6	45
Wright Cyclone	16
Liberty	81
Curtiss Hex	1
Total	765

John T. Annas

DETROIT, May 27—John T. Annas, president of the American Nut Co. and Motor City Sales Co., Inc., committed suicide yesterday as a result of ill health.

Pierce Opens Branch

DETROIT, May 27—A retail branch of the Pierce-Arrow Motor Car Co. is opening here today. L. J. Robinson, once a Buick distributor, is manager.

Wilson Foundry Reelects

DETROIT, May 27—The officers of the Wilson Foundry and Machine Co., Pontiac, have been reelected.

State Executives Restrict Device

Eastern Conference Will Require Lock-Out Arrangement With Free Wheeling

TRENTON, N. J., May 25—Free wheeling of such a design as to prevent optional gear control will be prohibited in the 14 Eastern States and Ontario, comprising the Eastern Conference of Motor Vehicle Administrators.

Benjamin G. Eynon, Pennsylvania motor vehicle commissioner, introduced the resolution in opposition to what he called "100 per cent free wheeling." It reads:

"Resolved that no free-wheeling device be allowed in the States comprising the Eastern Conference of Motor Vehicle Administrators unless it is of a design that gives the operator full control of all gears in all ratios as he desires."

The resolution has no bearing upon free wheeling transmissions offered by several manufacturers as a part of the original standard equipment of the car.

Discussion concerning the resolution brought out that objection to uncontrolled free wheeling was based upon the fact that coasting has been prohibited in practically all States in the Eastern Conference and that this type of unit is sold for replacement for cars which have not been designed with adequate braking capacity for safety.

Borg-Warner Declares

CHICAGO, May 25—Directors of Borg-Warner Corporation have declared the regular quarterly dividends of $1.75 a share on the preferred stock and 25 cents a share on common, both payable July 1 to stockholders of record June 15. C. S. Davis, president, in announcing the action, stated earnings have increased each month since February, and May shipments will equal those of April. Specifications for June shipment show an encouraging volume, he said.

Hupp Canadian Production Begins

DETROIT, May 28—Manufacturing operations at the Canadian plant of the Hupp Motor Car Co., in Windsor, Ontario, officially started today. Charles Miller was named plant superintendent of the Windsor division. The first car was off the assembly line this morning.

Accident Deaths Rise

WASHINGTON, May 27—The Department of Commerce has announced that during the four weeks ended May 16, 1931, 81 large cities in the United States reported 684 deaths from automobile accidents. This number compares with 614 deaths reported for the four-week period ended May 17, 1930.

General Motors Earnings Stated

First Quarter Figure Shows 61 Cents a Share on Common

NEW YORK, May 28—Net earnings of General Motors Corp., including equities in the undivided profits or the losses of subsidiary and affiliated companies not consolidated, for the first quarter ended March 31, 1931, amounted to $28,999,409, according to the pamphlet report issued today.

This compares with $44,968,587 for the corresponding quarter a year ago. After deducting dividends of $2,343,569 on the preferred stock, there remains $26,655,840, being the amount earned on the common stock outstanding. This is equivalent to $0.61 per share on the common stock, as compared with $0.98 per share for the first quarter of 1930.

Cash, United States Government and other marketable securities at March 31, 1931, amounted to $179,133,114, compared with $179,037,071 at the close of the previous quarter, Dec. 31, 1930, and with $125,814,939 a year ago. Net working capital at March 31, 1931, amounted to $292,723,601, compared with $281,037,636 at Dec. 31, 1930, and with $267,791,541 a year ago.

For the three months ended March 31, 1931, General Motors dealers in the United States delivered to consumers 231,881 cars, compared with 286,690 cars in the corresponding period of 1930.

Sales by General Motors manufacturing divisions to dealers in the United States amounted to 255,997 cars, compared with 323,443 cars in the corresponding three months of 1930. Total sales to dealers, including Canadian sales and overseas shipments, amounting to 304,547 cars, compared with 368,635 cars in the first quarter of 1930.

Bellanca Defends Plane

WILMINGTON, DEL., May 28—Giuseppe M. Bellanca, president of the Bellanca Aircraft Corp., New Castle, Del., this morning issued a statement pointing out the extreme and unusual hazards involved in flying a heavy airplane, at low altitude, with heavy loads, at high speed, in connection with the death this week of Shirley J. Short, and four companions, in the *Chicago Daily News* plane, "Blue Streak."

The "Blue Streak," a Bellanca plane of radical design, with tandem engines driving one pusher and one tractor propeller, had been successfully flown for more than two years, the statement points out. Observers of the Bellanca Aircraft Corp. sent to inspect the wrecked plane reported that its lifting struts were intact.

Financial Notes

Stutz Motor Car Corp. factory has operated on a profitable production basis for the first six months of its fiscal year. E. S. Gorrell, president, estimates net earnings for the month of May to be approximately $38,000, equal to thirty-five cents a share on its outstanding common stock. These estimated earnings are net, after all deductions.

Hercules Motor Co. have declared a regular quarterly dividend of 7½ cents a share due at this time.

J. I. Case Co. directors at Racine, Wis., voted the quarterly dividend of $1.75 a share on preferred stock and $1.50 a share on common.

Wilcox-Rich Corp. has declared regular quarterly dividend of 62½ cents on class A stock payable June 30, to stock of record June 20.

Spicer Mfg. Corp. and subsidiaries report net loss for first quarter of the current year $310,353. This compares with profit of $203,793 for first quarter of 1930.

Fairchild Aviation Corp. reports net profit for the first quarter of the current year of $11,027. Operating profit for the quarter was $46,840.

Libbey-Owens-Ford Glass Co. reports net loss for the first quarter of the current year of $188,072. Operations during March, however, showed a profit of $81,028.

Loss for the first quarter of the current year compares with the loss of $601,919 for the quarter ended December 31, 1930. March is the first month since June 1930 in which the company shows a profit.

Perfect Circle Co., Hagerstown, Ind., reports for the four months ended April 30, net profit of $210,630 after all charges and taxes, equal to $1.29 a share on 162,500 shares of capital stock, against $253,339, or $1.55 a share in the corresponding period of last year. April net income this year was $84,446 or 52 cents a share, compared with $118,850 or 73 cents a share in April, 1930.

The company's balance sheet as of April 30 shows current assets of $1,835,136 of which $632,221 was cash and government securities. Current liabilities were $165,239 and surplus was $1,275,875. On Dec. 31 last Perfect Circle had current assets of $1,744,219, of which $591,453 was cash and marketable securities; current liabilities were $235,607, including dividend payable of $81,317 and surplus was $1,147,909.

Indian Motocycle Co. reports a profit for the months of March and April of $46,396, as compared with a loss of $106,825 for the corresponding two months of 1930. The company attributes its improvement in position largely to the reorganization which recently took place under E. Paul duPont, president. Future prospects are regarded as good, and Mr. duPont states that the manufacturing economies have made possible a profit on a smaller volume of business than they were doing before.

Curtiss Aeroplane and Motor Co. reports net loss for the first three months of the current year of $46,515. This compares with loss for corresponding period of last year of $61,449.

Briggs and Stratton Corp. has declared a regular quarterly dividend of 50 cents, payable June 30 to stockholders of record on June 20.

Johns-Manville has declared a regular quarterly dividend of 75 cents on common stock, payable July 15 to stockholders of record June 24, and $1.75 on preferred stock, payable July 1 to stockholders of record June 15.

Bendix Aviation Corp. directors have declared the regular quarterly dividend of 25 cents a share, payable July 1 to stockholders of record on June 10. Vincent Bendix, president of the corporation, reported that earnings for the first quarter, after taxes and all other charges, were $798,000. Of this amount, $221,000 represented non-recurring earnings. For the month of April earnings, after taxes and all other charges, were $352,000.

Rail Executives File Coordination Brief

Ask "Fair Regulation" of Motor Vehicle Operation for Profit

WASHINGTON, May 28—Reflecting the views of the railroads of the country, the Association of Railway Executives yesterday filed with the Interstate Commerce Commission their brief in the motor-rail coordination investigation proceeding urging "a fair system of regulation of motor vehicles operating in interstate commerce on the highways for profits."

The position of the railroads is outlined as follows:

That regulation should extend to passenger common carriers and charter buses (but not to taxicabs, school buses or hoted buses), and to common carrier and contract motor carrier trucks operating on the highways for compensation or hire, but do not at this time recommend that it be applied to owner-operated trucks solely in the business of the owner.

That such regulated motor carriers should be required to obtain from the Interstate Commerce Commission certificates of convenience and necessity and that in determining on the issue of such certificates the commission should give proper consideration to—

The quality and permanence of the service to be offered by the applicant;

Existing transportation service, requiring that a showing be made, satisfactory to the commission, of the necessity for and convenience to the public of the proposed operation;

That the financial responsibility of the applicant, including adequate provision for surety, or insurance, for the protection of the public.

That (a) an applicant to whom a certificate of convenience and necessity is granted by the commission should be required to comply with all the conditions in each state that duly authorized state authorities impose upon intrastate operations on its highways;

(b) proper accounts, in forms prescribed by the commission, should be kept and reports be periodically made;

(c) adequate requirements should be imposed to secure just and reasonable rates, both maximum and minimum, with provision for publication thereof and adherence thereto and proper inhibition against undue and unjust discrimination.

That opportunity should be given for rail carriers to engage in such motor vehicle service on the highways.

Hardware Assn. to Meet

NEW YORK, May 27—The National Hardware Association of the United States, will hold its 37th annual convention, at the New Palmer House, Chicago, Oct. 19 to 22.

Rubber Exempt From New Ban

Import Ban on Goods Made by Forced Labor Does Not Apply

WASHINGTON, May 26 — Rubber and other products essential to the American automotive industry will not be affected in the slightest degree by the provision in Section 307 of the Hawley-Smoot tariff act which prohibits importation of goods produced by forced or indentured labor, beginning Jan. 1, 1932. A clause in the provision exempts its application to goods not produced "in such quantities in the United States as to meet the consumptive demands of the United States."

The newspaper story picturing the embargoing of some $700,000,000 worth of imports a year by reason of the provision named rubber from British Malaya as one class of goods which would be barred on the ground that it is produced by indentured labor. It failed to mention the fact that the provision does not apply to products not supplied in this country in sufficient quantities to meet domestic requirements.

Nebraska Restricts Trucks

NEW YORK, May 25—Nebraska recently passed over the veto of Governor Charles W. Bryan, a law limiting the carrying capacity and raising registration fees on motor trucks.

The law provides for a length limit of 35 ft. on a single unit and 50 ft. on a combination, a width of 96 in., a net load on farm and municipal trucks of 16,000 lb., carrying capacity on other trucks of seven tons, and a speed limit of 35 miles an hour on freight vehicles towing trailers.

Registration fees range from $2.00 on a one-ton truck to $110 on a seven-ton vehicle. The fee on farmer owned trucks of shipping weight more than 2600 lb. is raised from $8.00 to $12.00.

Brooks Motors to be Sold

STRATFORD, ONT., May 25—Brooks Steam Motors, Ltd., of Canada, will be offered for sale by tender. The plant for four years has been the centre of a maze of legal entanglement, and the decision comes as a result of a recent granting of a winding-up order granted to a Toronto solicitor for a group of shareholders of Brooks stock.

Studebaker N.Y. Sales Gain

NEW YORK, May 25—Sales of Studebaker cars in greater New York for the first four months of the current year were 49.3 per cent ahead of the same period last year, according to new car registration figures announced by Sherlock and Arnold, statisticians.

+ + CALENDAR + + OF COMING EVENTS

SHOWS

International Garage Exposition, Berlin, Germany .....May 9-Aug. 9

CONVENTIONS

Natl. Automobile Chamber of Commerce, New York City (Directors' Meeting) .....June 3

Natl. Automobile Chamber of Commerce, New York City (Members' Meeting) .....June 4

S.A.E. Summer Meeting, White Sulphur Springs .....June 14-19

Steel Founders Society (Mid-Summer), French Lick, Ind....June 17-19

National Association of Credit Men, Boston, Mass. .....June 22-27

American Society Mechanical Engineers, Madison, Wis. (Oil and Gas Power Meeting).....June 23-26

National Association of Taxicab Owners, Chicago, Ill. .....June 29-30

S.A.E. Aeronautic Meeting (in conjunction with Natl. Air Races), Cleveland, Ohio .....Sept. 1-3

Eastern States Exposition, Springfield, Mass. .....Sept. 20-26

American Welding Society, Boston, Mass. .....Sept. 21-25

American Electric Railway Assn., Atlantic City, N. J.....Sept. 26-Oct. 2

National Safety Council, Chicago, Ill. .....Oct. 12-16

Society Industrial Engineers, Pittsburgh, Pa. .....Oct. 14-16

Transportation Meeting, S.A.E., Washington, D. C. .....Nov. 10-12

Brown Adds Transmission

DETROIT, May 25 — Brown-Lipe Gear Co. is announcing the introduction of a new transmission for 1½ to 2½ ton trucks, a feature of which is easier shifting, known as the model 224. It has an interrupted tooth type of jaw clutch, has the shifting member between third and fourth speeds, third speed gears being the constant mesh type. Anti-friction bearings are used on both main and countershaft and gears of the spur type and of 3½ per cent nickel steel. Low speed gears are of the stub tooth type. Openings for power take-off are provided on both sides of the transmission. The reverse idler gear is not in constant mesh with the countershaft.

Peerless Adopts Free Wheeling

CLEVELAND, May 27 — Peerless Motor Car Corp. has announced a new de luxe edition of the present series of Master Eight and Custom Eight automobiles, according to J. A. Bohannon, president.

The new cars include free wheeling with positive gear control, safety four-wheel brakes, a wide variety of new exterior colors, new upholstery and interior fittings.

Allis Seeking Condit Corp.

Negotiating With American Brown-Boveri for Sale

NEW YORK, May 25—Allis-Chalmers Mfg. Co. has entered negotiations with the American Brown-Boveri Co., Inc., looking toward the acquisition of the Condit Electrical Mfg. Corp. of Boston and the electrical business of American Brown-Boveri.

The principal products to be acquired by this deal are mercury arc rectifiers, electric furnaces, switch gear and traction equipment, blowers and compressors, all of which will be new products for Allis-Chalmers.

A tentative contract has been made with the Brown-Boveri Co. of Baden, Switzerland, by which Allis-Chalmers will have exclusive use of their patents and new developments, etc., pertaining to their lines.

The purchase will be paid for principally in stock of Allis-Chalmers, but the amount cannot be determined until a complete audit has been made.

Founders Drop Convention

NEW YORK, May 25—Steel Founders' Society of America, Inc., will not hold its usual mid-summer convention as scheduled for French Lick Hotel, French Lick, Indiana, June 17 to 19. The decision not to hold the meeting this year was made in keeping with a policy of economy called for at the present time.

The society, however, will continue its major important activities and plans to hold either a regular meeting some time in June or a series of regional meetings at various points throughout the country.

The board of directors will meet at the Hollenden Hotel, Cleveland, Thursday, June 11.

Dutch to Study Rubber

NEW YORK, May 25—Dutch Colonial Ministry will undertake an exhaustive study of the rubber situation, according to cable reports received here by the Rubber Exchange in New York last week.

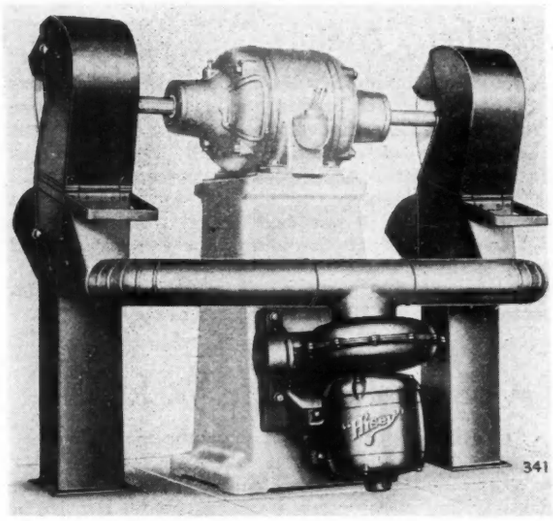
A meeting of the growers was held at the Ministry last week, and a subcommittee was appointed for the purpose of drawing up a report on the situation.

Toledo Steel Reports Gain

TOLEDO, May 25—An increase of 26 per cent in its replacement parts business in the first four months is reported by the Toledo Steel Products Co., makers of valves, bolts and bushings, compared with the same period last year. April showed a decided upturn.

NEW AUTOMOTIVE DEVELOPMENTS

Hisey Exhauster Equipment

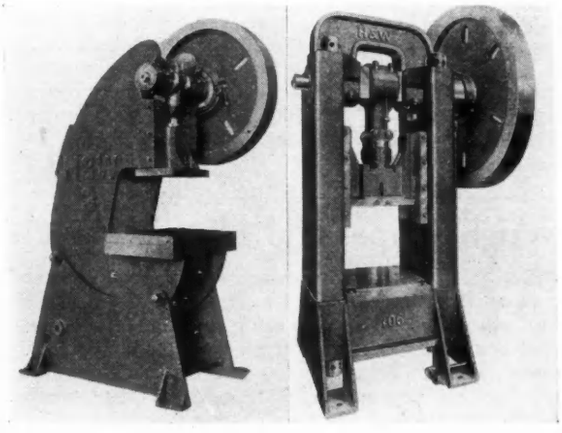


ACCORDING to a recent announcement by The Hisey-Wolf Machine Co., Cincinnati, Ohio, Hisey buffing and polishing machines now can be equipped with a ball-bearing, motor-driven exhauster. The automatic motor starter is arranged to control both motors simultaneously.

Henry & Wright All-Steel Presses

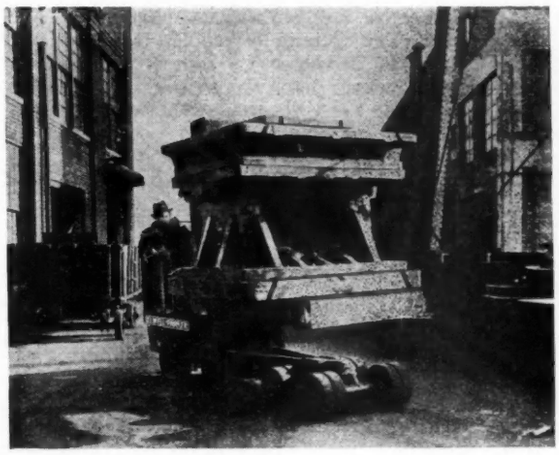
A SERIES of All-Steel, Straight-Sided and Inclinable Presses has been added by The Henry & Wright Manufacturing Company, of Hartford, Conn. The straight-sided presses are furnished in either flywheel, single geared, double geared or triple geared types with crankshafts up to and including 12 in. in diameter, the larger presses being equipped with single or twin geared drive, as preferred. Illustration 1 of the No. 106 Single Crank, Straight-Sided Press, flywheel type, shows the shrunk-in tie rod type of construction employed. An important feature is that the fabricated steel units are thoroughly annealed before machining to eliminate strains set up in the rolling or welding processes.

On the Inclinable Presses the frame, slide and legs are made of welded steel construction, annealed before machining and of ample proportions to give exceptional rigidity to the tools. Heat treated crankshafts made from hammered alloy steel forgings and mounted in bronze bushed bearings are also used in the Inclinable line. The lower end of the connection is of the ball type and contacts a hard bronze seat in the slide.



Elwell-Parker 15-Ton Electric Die Handler

TO facilitate loading, unloading and storing large body dies, The Elwell-Parker Electric Co., Cleveland, Ohio, has developed a 15-ton electric tiering truck. This machine weighs approximately 13,000 lb. and is powered by a gas-electric unit which delivers power through an electric motor at the operator's end. The loading platform is of the cantilever type, arranged to travel up and down the vertical members of the frame. The raising of the load platform is by means of an electric winch mounted between the powerplant and the uprights. In addition to elevating the load, this winch drives a secondary countershaft fitted at each end with a cable drum. The cables are used for loading and unloading the die.

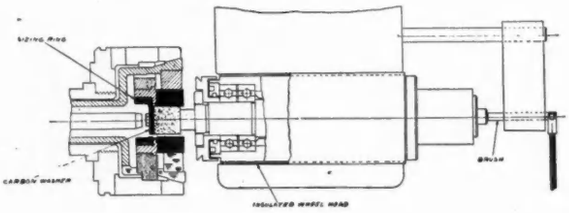


Bryant Chucking Grinder Sizing Device

ANOTHER step toward increasing the accuracy of internal grinders has been made by the Bryant Chucking Grinder Co., Springfield, Vt., with the introduction of an automatic electrical sizing

NEW DEVELOPMENTS
Automotive Parts, Accessories and Production Tools

device which is claimed to be fool-proof and independent of wearing parts. The size of work is controlled by means of a carbon washer mounted beside the grinding wheel and a sizing ring mounted in the chuck. These two elements make electrical contact

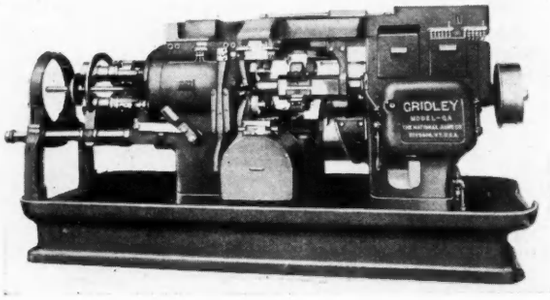


when the predetermined size has been reached and back off the feed a few thousandths so that grinding is stopped.

It is not necessary that actual physical contact be made between the carbon washer and sizing ring and there is never contact between the wheel and sizing ring. By applying different voltages it is possible to knock off at different sizes. By applying a relatively high voltage for rough grinding, the feed is knocked off at a predetermined rough size, then after dressing the wheel, a lower voltage may be applied to cause the feed to knock off later at the finished size. The voltage is readily adjusted and ranges from .5 to 20 volts. Current is provided by a transformer when an A.C. source is available. When D.C. is used the voltage is cut down by resistance.

National Acme "GA" Automatic Screw Machines

AN entirely new multiple spindle automatic screw machine has been placed on the market by The National Acme Company, of Cleveland, Ohio. This machine, known as the Model "GA," is available in five sizes: 1⅜, 1⅝, 2⅝, 3, 3 5/16 in. The frame is of box form type with two independent uprights and a heavy top bracket insuring positive rigidity, freedom from tool vibration. It is so designed that chips from the cutting tools can flow through the center of the frame into the pan. It is arranged to thread to the third or fourth position or both, and these



same attachments can also be used for accelerated reaming or turning operations. High speed drilling attachments can be used in all four positions. The machine can be operated in high or low speed from either side of the machine.

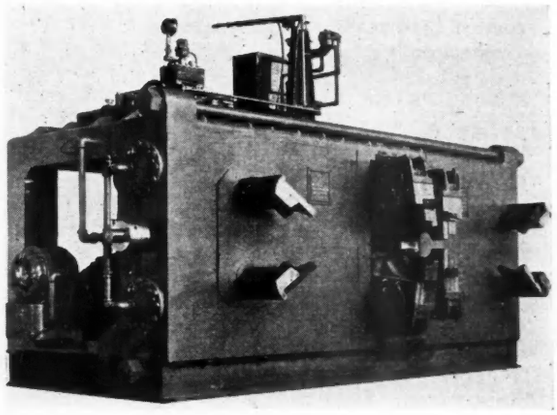
Floor space required for the 1⅜ and 1⅝-in. machine is 17 ft. 4 in., which is the overall length including the stock reel. The overall length of the 2⅝-in., 3-in. and 3 5/16-in. machines is 21 ft. including the stock reel. The two smaller sizes take a 15 hp. motor, 1800 r.p.m. The three larger sizes take a 20 hp. motor, 1800 r.p.m.

Allegheny Metal

IN an effort to simplify the nomenclature of various types of chrome base alloys made by the Allegheny Steel Co., the company will use the name Allegheny in connection with all their products. Under this setup the following nomenclature will be used. Allegheny metal (17 to 20 per cent chromium, 7 to 10 per cent nickel), Allegheny 33 (12 to 16 per cent chromium), Allegheny 44 (22 to 25 per cent chromium, 10 to 13 per cent nickel), Allegheny 55 (26 to 30 per cent chromium), Allegheny 66 (15 to 18 per cent chromium).

Taylor-Winfield Pipe Welder

ACCORDING to a recent announcement by The Taylor-Winfield Corp., Warren, Ohio, they have just delivered one of the largest welders this company has built. This machine, Model HP 12, is designed to weld a double length pipe by butt welding two standard lengths end to end making lengths approximately 48 ft. long. The range is from 2 to 16 in. standard pipe size. One of the features of



this machine is the hydraulic automatic attachment by means of which the upset pressure can be quickly adjusted to suit the entire range of small and large size pipe. The welding cycle ranges from 4 to 40 sec. It may be changed with facility by adjusting a dial. Some idea of the capacity of this machine may be gained from the fact that it provides an upset pressure of 200,000 lb. wherever required. The weight of this machine is 65 tons.

Wright Type WH Electric Hoist

FOR hoist installations requiring economy in head room, the Wright Mfg. Co., Bridgeport, Conn., has just placed on the market the type WH electric hoist specifically designed for close quarters. The minimum distance from the bottom of the I-beam to the hook on the ½-ton hoist is only 11 in.; on the 1-ton model, only 13 in.

☆

DURING THE WOOD WHEEL ERA, THE MAN WHO WANTED WIRE WHEELS ON HIS CAR PAID A PREMIUM FOR THEM . . . . TO-DAY THANKS TO THE PROGRESSIVE EFFICIENCY OF WHEEL MANUFACTURERS, MOST OF THE CARS PRODUCED IN THIS COUNTRY ARE EQUIPPED WITH WIRE WHEELS AT NO EXTRA COST.

BUDD WHEEL COMPANY

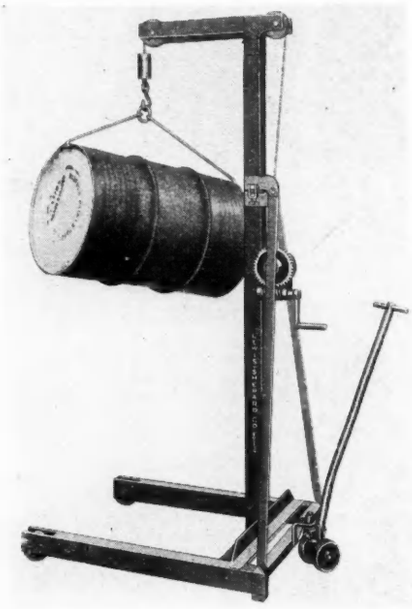
DETROIT · · · · PHILADELPHIA

☆

NEW DEVELOPMENTS
Automotive Parts, Accessories and Production Tools

Lewis-Shepard Portable Crane

A NEW line of portable cranes has been added by the Lewis-Shepard Co., Boston, Mass., to round out their line of materials handling equipment. These machines are made in four distinct types, the one in the illustration being the hinged type which can be taken through practically any doorway and yet can be used to the full height to



the ceiling. This machine has a capacity of 500 to 2000 lb. with a range in height of 6 to 14 ft.

Another type is the telescopic machine with similar features. In addition there are the revolving hinged type and the revolving telescopic type. All these machines can be furnished with a hand spur-drive winch, a hand worm drive winch, and an electric drive winch. Air motor and gas engine drives can also be utilized wherever required.

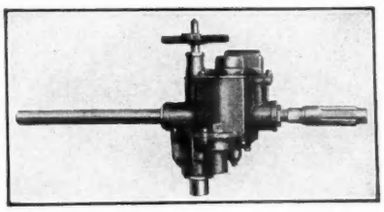
"Ohio" Gears and Cams In Spot Welding

TAYLOR-WINFIELD spot welders designed for continuous operation in automotive plants are semi-automatic, and so arranged that the fatigue of the operator is reduced to a minimum. The operator merely inserts the sheets or strips to be welded and presses the pedal. The machine applies the correct pressure, turns on and cuts off the welding current, and releases the finished weld. This sequence of operations is accomplished by means of a motor-drive through cams and gears manufactured by the Ohio Gear Co., Cleveland, Ohio.

The speed of the ½ hp. motor is reduced to the slow speed necessary for raising and lowering the upper welder jaw—approximately 60 to 120 r.p.m. —by a worm and worm-wheel. The worm shaft drives the reciprocating arm mechanism through a timing clutch similar in principle to that of a punch press—that is, the pedal may be pressed down at any time, but the clutch will not engage until a certain point of the revolution of the shaft. The arm motion is accomplished by a cam. A second cam controls the primary transformer current.

C-P Close Quarter Rotary Drill

ANOTHER pneumatic rotary drill, C-P No. 99-C of the "Power Vane" type, has been added by the Chicago Pneumatic Tool Co., New York, N. Y. It has a capacity of 1½-in. drilling and 1⅛-in. reaming, with a length of feed of 4½ in. This unit is

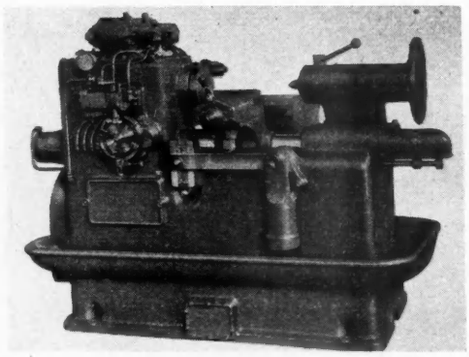


particularly adapted for close quarters as well as general purpose drilling and reaming.

Light speed is 300 r.p.m. Overall length 14¾ in. Net weight only 35 lb.

Barnes No. 12 Automatic Lathe With Hydraulic Feed

A SMALLER-SIZED automatic lathe, the No. 12, with hydraulic feed has been added by the John S. Barnes Corp., Rockford, Ill. One of the features is casting the headstock, bed and base in one piece, thus providing a very rigid construction. The Multi-range hydraulic feed is provided by pumps driven and controlled from the main spindle. A separate Barnes gear pump supplies the rapid traverse. A single lever controls the rapid traverse and the speed and feed mechanism are operated in response to the rapid traverse action. The range of feeds is from



0.001 in. to 0.10 in. per revolution of the main spindle. The feeds of the two carriages are entirely independent and a dial for setting each is provided.

High spindle speeds for turning with cemented-tungsten-carbide tools is another feature of this machine. Speed changes are made by means of pick-off gears, while herringbone gears drive the spindle, making only two gear contacts in the machine.

The swing is 13 in. Floor space 47 x 77 in., and net weight 5250 lb.

'ROUND THE CORNER

The Regal line—built for vocational schools, garages, repair, maintenance and light manufacturing. Ask forthe complete story.

LE BLOND

LE BLOND

LE BLOND

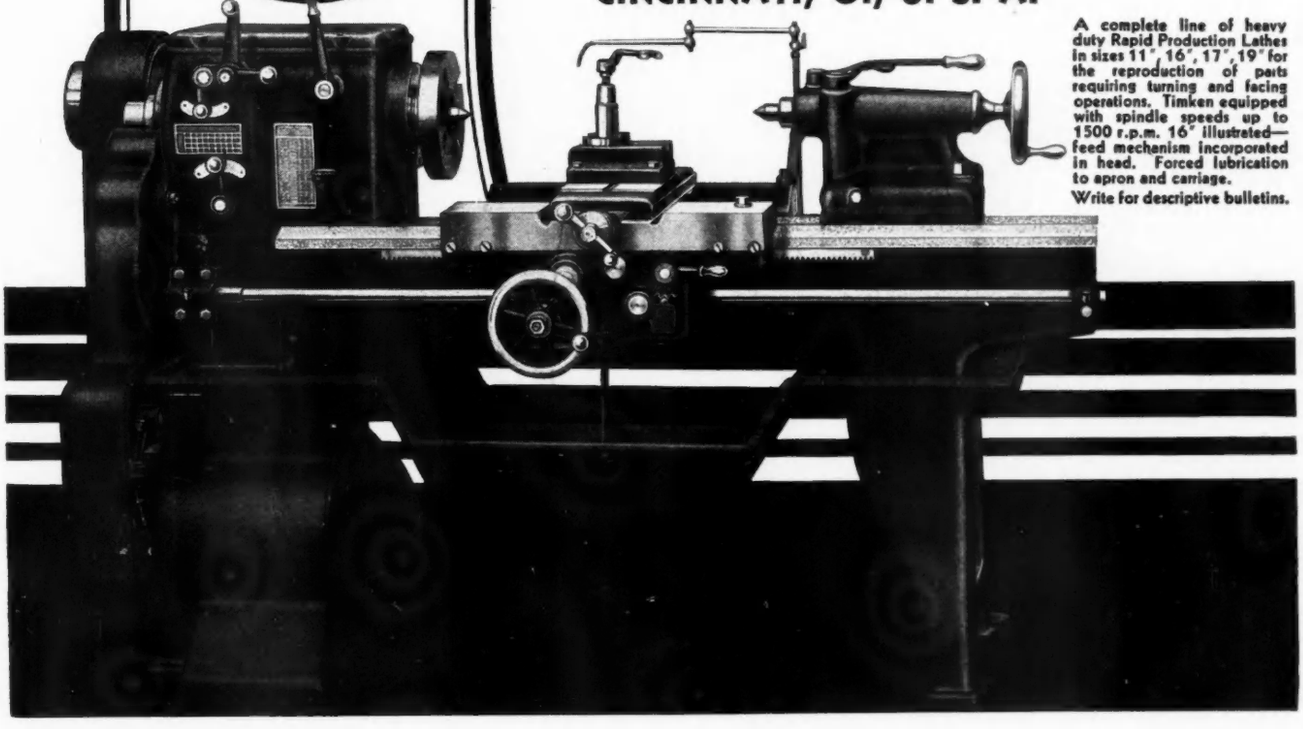
PROFIT FOR YOU

YOU can never tell what is 'round the corner. Sometimes it is the thing that points the way to success—waiting for you to bump into it.

Manufacturers using LeBlond tools have found it true. They know that LeBlond tools mean increased production as well as a high standard of precision and accuracy.

'Round the corner is the road to substantial profits. This suggestion should mean PROFIT FOR YOU.

THE R. K. LEBLOND MACHINE TOOL CO.
CINCINNATI, O., U. S. A.



A complete line of heavy duty Rapid Production Lathes in sizes 11", 16", 17", 19" for the reproduction of parts requiring turning and facing operations. Timken equipped with spindle speeds up to 1500 r.p.m. 16" illustrated—feed mechanism incorporated in head. Forced lubrication to apron and carriage.

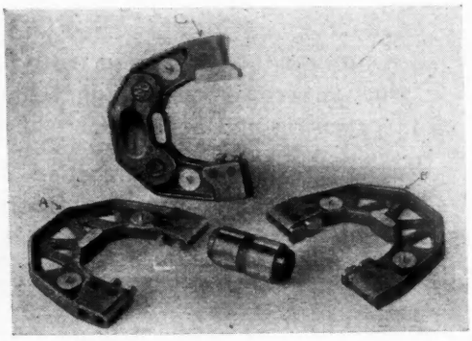
Write for descriptive bulletins.

NEW DEVELOPMENTS
Automotive Parts, Accessories and Production Tools

P. & W. New Style of Adjustable Snap Gages

THE Pratt & Whitney Co., Hartford, Conn., have just placed on the market three new styles of snap gages, Model C, Model B and Model A gages. All three are of the standard Trusform style. The Model C gage is made in 15 sizes, which provides a complete gaging range from 0 to 12 in. The Model B gage is provided in eight sizes, giving ranges from ⅛ in. to 5 in. The Model A gage is available in eight sizes ranging from 0 to .5 in.

The Model C gage is made with one solid anvil and two adjustable anvils assembled in the Trusform frame. This type of gage is equipped with a Bakelite grip on either side to insulate the frame from



the heat of the operator's hand, as well as to facilitate handling. In using the Model C gage, the solid anvil is rested on top of the work in the machine, and the gage is then rocked into gaging position. This brings first the "Go" anvil in contact with the work and then the "Not Go."

The Model B adjustable limit snap gage differs from the Model C in that four square adjustable anvils are used. These anvils are so placed in the frame that the gap between them is too small to allow the work to drop between. All the anvils of the Model B gage are made of high-grade tool steel and are heat-treated and lapped. The anvils are sufficiently wide to permit checking to a shoulder without interference from the gage frame.

The Model A gage differs from the others in that it has four round anvils with much smaller contact surfaces. For some types of gaging a more sensitive "feel" is necessary, and the smaller round anvils of the Model A gage provide this.

Bliss Automatic Multiple Disk Friction Clutch

THE latest product of the E. W. Bliss Co., Brooklyn, N. Y., is a new magnetic control for multiple disk friction clutches and brakes used on power punching presses. The clutch is of the multiple plate type without the usual operating links and levers. The pull of the magnet is transmitted directly to the moving plate and none of the thrust is transferred to the bearings. The magnetic brake is of the type ordinarily used with manipulator and crane motors and is specially wound to suit press operating conditions. This control equipment provides full automatic features and were two or more operators employed, provides safety for all. The cabinet is provided with two start buttons and one emergency stop for each operator. The start buttons are of the lock-in type which makes it possible to close any of them when the full number of operators are not employed. In addition a foot switch can be provided for operation with all hand buttons locked in.

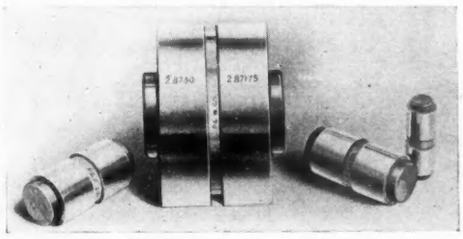
The four stations of the transfer switch give the following operating conditions: 1. Automatic top stop. With all hands on start buttons the press will complete one cycle and stop with the slide at the stop stroke. 2. Continuous run. 3. Inching. This station is used for die setting. The press runs as long as the button is depressed. 4. Automatic top stop with sustained hold. This cycle is similar to the first except that the buttons are not to be released immediately but must be held until the slide reaches the bottom stroke.

Snap Case-Front Industrial Thermometer

THE C. J. Tagliabue Mfg. Co., Brooklyn, N. Y., has placed on the market an industrial thermometer with many important improvements including a new snap case-front. This has been designed to make cleaning easy and at the same time to make breakage almost impossible. A tongue at the top of the case fits snugly in a groove in the front so that in either opening or closing the front it cannot slip and fall.

P. & W. Setting Plugs for Snap Gages

THESE setting plugs, combining "Go" and "Not Go" in one piece, for setting snap gages quickly, and for checking the setting as needed, have been placed on the market by the Pratt & Whitney Co., Hartford, Conn. They are made by the same process and standards of accuracy as are P & W cylindrical gages, of high-grade steel, ground and machine lapped. Plugs 1-in. in diameter and larger are made



from Trilock blanks, with the separate members held together solidly by a screw, and separated by a washer of smaller diameter. Smaller plugs are made solid, with both gaging dimensions in one piece.

All setting plugs have an insulator on each end so that the heat of the operator's fingers will not affect the gaging size. These insulators are colored to identify the gaging diameters, red for the "Not Go" end and green for the "Go" end.